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ORIGINAL COMMUNICATIONS.

> "A body of men engaged in the same pursuit form a joint stock of their informa[illegible] experience, and thereby put every individual in possession of the sum total acquir[illegible] them all."—REV. DR. WILLIAM CAREY.

Calcutta:

BISHOP'S COLLEGE PR[illegible]

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Notice of the Flower Garden attached to the Cinchona Nursery at Rungyroong near Darjeeling with a list of the Species growing in it.—By Dr. Anderson, *Superintendent of the Royal Botanical Gardens, Calcutta.*

Since the establishment of the Cinchona Nursery at Rungyroong in the beginning of 1865, seeds of European, Australian and Cape plants, which there was little prospect of cultivating successfully in the Botanical Garden of Calcutta, have been grown in the small garden formed round the dwelling houses of the Gardeners in charge of the Cinchona cultivation. An interesting collection of flowering plants and shrubs has thus been brought together within the limits of 3 or 4 acres. I have drawn up a complete list of the plants in this collection, and it shows how many rare and interesting species can be grown even in so wet a climate as that of Sikkim. The Cinchona Nursery at Rungyroong is about 1,000 feet lower in altitude than the station of Darjeeling and accordingly the temperature is several degrees higher; the sky is also less obscured by the mists and fogs which prevail at higher elevations. The winter at this elevation is so mild that Plantains, tree ferns, Fuchsias and Geraniums are uninjured by the slight frosts. The position of the nursery is also favourable for gardening, the aspect being towards the South-west. The slopes are steep enough to afford good drainage without fear of the soil being washed away by the heavy rains. The garden consists merely of narrow open borders by the sides of the roads which it was necessary to make to allow of the operation connected with the Cinchona cultivation being carried on. The slopes between the zigzags of the roads have also been grassed and planted with ornamental trees and shrubs. A considerable number of annuals ripened their seeds in this garden during last August and September, and many of these were sown in the Botanical Gardens in October and November and grew well. Among these, species of *Caryophyllaceæ* (the Pink family) of *Œnothera* among *Onagrarieæ* and *Compositæ* yielded the largest crop of good seed. More care will be taken during this autumn to secure a larger crop of seeds in time for distribution from the Botanical Gardens Calcutta for sowing during the cold weather.

Notwithstanding the heavy rains of Sikkim (about 160 inches annually) several species of bulbous plants (especially *Irideæ*) have grown luxuriantly and have flowered. Tuberous plants succeed quite as well as bulbous species, for example the numerous varieties of *Dahlia* many of which produce well-formed double flowers. The damp climate favours the development of fodder grasses, especially of those that in Europe inhabit moist low lying meadows: such species as *Holcus mollis* and *lanatus* and *Dactylis glomerata.* The Italian and the perennial rye grasses along with a less commonly known one, *Lolium Bouchianum*, also *Anthoxanthum odoratum* and *Arrhenatherum avenaceum* have yielded luxuriant crops of grass and have produced a quantity of good seed.

However none have grown more vigorously than a nearly imported species, *Bromus unioloides*, which was distributed by the Society last year; its flowering culms were about 2½ feet high and it has seeded abundantly.

The introduction of such grasses on a large scale would confer a great benefit on the inhabitants of Sikkim and the residents at Darjeeling, as their cattle and horses are now fed on Bamboo's leaves and the rank weedy grasses which spring up on Tea plantations, and when those are scarce on the leaves of a species of *Ficus* or more rarely on the fronds of the dwarf palm *Wallichia oblongifolia.*

As yet the beauty of the garden has been caused entirely by the profusion of annuals and small herbaceous plants which flower a few months after planting; but lately some of the earlier planted shrubs have begun to flower. Among such I may notice *Callystachys, Psoralea verrucosa, Hypericum Androsæmum, Cistus hirsutus* and *creticus, Genista mantica, Hydrangea Hortensia* and *Leycesteria formosa.*

RANUNCULACEÆ.

Clematis acuminata, *DC.*
,, Buchananiana, *DC.*
,, connata, *DC.*
,, flammula, *L.*
,, grewiæflora, *DC.*
,, viticella, *L.*
Thalictrum affine,
B. simplex.
Anemone Japonica,
Adonis æstivalis, *L.*
Ranunculus arvensis, *L.*
,, diffusus, *DC.*
,, lætus, *Wall.*
,, repens, *L.*
Isopyrum adiantifolium *Hf. et. T.*
Nigella nigellastrum *B. et Hf.*
Delphinium consolida, *L.*
Aconitum palmatum, *Don.*

CALYCANTHACEÆ.

Calycanthus floridus, *L.*
,, præcox, *L.*

MAGNOLIACEÆ.

Talauma Hodgsoni, *Hf. et. T.*
Magnolia Campbellii, *Hf. et. T.*
,, grandiflora, *L.*
Michelia Cathcartii, *Hf. et. T.*
,, excelsa, *Blume.*
,, lanuginosa, *Wall.*

MENISPERMACEÆ.

Aspidocarya uvifera, *Hf. et. T.*
Stephania elegans, *Hf. et. T.*
,, rotunda, *Lour.*

BERBERIDEÆ.

Decaisnea insignis, *Hf. et. T.*

Holbollia latifolia, *Wall.*
Akebia quinata, *Don.*
Berberis aristata, *DC.*
„ insignis, *Hf. et. T.*
„ Japonica.
„ Nepalensis, *Spr.*
„ sp: Java.

PAPAVERACEÆ.

Papaver amœnum, *Lindl.*
„ argemone, *L.*
„ dubium, *L.*
„ nudicaule, *L.*
„ Rhœas, *L.*
„ somniferum, *L.*
Argemone mexicana, *L.*
Meconopsis nepalensis, *DC.*
Glaucium fulvum.
„ luteum, *Scop.*
„ rubrum,
Chelidonum majus, *L.*
Dicentra thalictrifolia, *Hf. et. T.*

CRUCIFERÆ.

Mathiola annua, *Sweet.*
Cheiranthus cheirii, *L.*
„ maritimus.
„ var. albus.
Nasturtium officinale, *R. Br.*
Barbarea præcox, *Br.*
„ vulgaris, *Br.*
Arabis gerardia, *Bess.*
„ Japonica.
Cardamine hirsuta, *L.*
Alyssum maritimum, *Lam.*
Cochlearia officinalis, *L.*
Hesperis tristis, *L.*
Malcomia africana, *R. Br.*
„ maritima, *R. Br.*
Sisymbrium officinale, *L.*
Erysimum orientale, *Br.*
„ Perofskianum.
Camelina sativa, *Cr.*
Sinapis arvensis, *L.*
Brassica alba, *Boiss.*
„ dissecta, *Boiss.*
„ juncea, *Boiss.*
Lepidium latifolium, *L.*
var: angustifolium,
Biscutella ciliata *DC.*
Thlaspi ceratocarpon, *Murr.*
Iberis amara, *L.*
Isatis tinctoria, *L.*
Crambe aspera, *Biel.*
Raphanus caudatus.

RESEDACEÆ.

Reseda alba.
„ crystallina.
„ fruticulosa, *L.*
„ odorata, *L.*

CISTACEÆ.

Cistus creticus, *L.*
„ hirsutus, *Lam.*
Helianthemum vulgare, *Gært.*

VIOLACEÆ.

Viola odorata, *L.*
Viola serpens, *Wall ?*
„ tricolor, *L.*

POLYGALACEÆ.

Polygala arillata,

CARYOPHYLLACEÆ.

Sagina procumbens, *L.*
Dianthus barbatus, *L.*
„ chinensis, *L.*
„ caryophyllus, *L.*
„ Hedwigii.
„ Sequieri.
Saponaria calabrica.
„ „ var: marginata.
„ officinalis, *L.*
Silene Armeria, *L.*
„ „ var: rosea.
„ atoicion, *Murr.*
„ Firma.
„ maritima, *With.*
„ parviflora, *Pers.*
„ pendula, *L.*
„ wolgensis, *Otth.*
Lychnis coronaria, *Lam.*
„ Fleargana.
„ Flos Jovis, *L.*
„ vespertina, *Sibth.*
„ viscaria, *L.*
Cerastium monospermum, *Ham.*
Arenaria marina,
Spergularia nodosa, *L.*
„ var. maritima,
„ arvensis, *L.*
Drymaria cordata, *Willd.*

PORTULACACEÆ.

Portulaca, sp.
Calandrinia compressa.
„ grandiflora.

HYPERICINEÆ.

Hypericum androsæmum, *L.*
Hypericum Napaulense, *Chois.*
„ orientale, *L.*
„ patulum, *Thunb.*
„ perfoliatum.
„ tetrapterum.

TERNSTRŒMIACEÆ.

Cleyera ochnacea, *DC.*
Eurya multiflora. *DC.*
Actinidia.
Saurauja Nepaulensis.
Gordonia Wallichii.
Camellia Japonica *L.*
„ Thea, *Seem.*
Camellia Kissi, *Wall.*

MALVACEÆ.

Malope trifida, *Cav.*
Althæa rosea, *L.*
Lavatera alba.
„ rosea.
„ Thuringiaca, *L.*
Malva Caroliniana, *L.*
„ mauritiana. *L.*
„ parviflora, *L.*
„ Peruviana, *L.*
Sida malvæflora, *DC.*
„ retusa *L.*
Pavonia præmorsa, *Willd.*
Hibiscus splendens.

LINACEÆ.

Linum grandiflorum, *Desf.*
„ usitatissimum, *L.*
Reinwardtia trigyna, *Planch.*
„ tetragyna, *Planch.*
Anisadenia, sp.

GERANIACEÆ.

Geranium aconitifolium, *L'her.*
„ pratense, *L.*
„ sanguineum, *L.*
„ Grevilleanum.
Pelargonium Zonale, *Willd.*
„ sp.
„ sp.
„ sp.
„ sp.
„ tomentosum.
Tropæolum majus, *L.*
„ Scheurianum.
Oxalis Bowieana alba.
„ „ rubra.
„ „ rosea.
„ corniculata *L.*
„ „ Emodi,
„ sp.
Impatiens Balsamina, *L.*
„ discolor, *DC.*
„ Jurpia, *Ham.*
„ leptoceras, *DC.*
„ multiflora, *Wall.*
„ puberula, *DC.*
„ racemosa, *Wall.*
„ trilobata, *Coleb.*

RUTACEÆ.

Ruta angustifolia, *Pers.*
„ macrophylla, *Sol.*
Bœnninghausenia albiflora, *Rich*
Toddalia,
Skimmia,

OLACINEÆ.

Ilex dipyrena, *Wall.*

CELASTRINEÆ.

Euonymus, sp.
Celastrus, sp.

AMPELIDEÆ.

Vitis vinifera,

SAPINDACEÆ.

Acer sp.
Turpinia sp.

SABIACEÆ.

Sabia limonacea.

ANACARDIACEÆ.

Rhus, sp.

LEGUMINOSÆ.

Baptisia australis, *R. Br.*
Bossiæa heterophylla, *Vent.*
„ linophylla, *R. Br.*
Lupinus Hartwegii,
„ nanus,
„ polyphyllus,
Genista anglica, *L.*
„ canariensis, *L.*
„ mantica, *Poll.*
„ ramosissima *Poir.*
„ tinctoria, *L.*
Spartium Æthnense, *Bivon.*
„ junceum, *L.*
Ulex europæus, *L.*
Sarthamnus scoparius, *Thimm.*
Cytisus albus, *Link.*
„ „ incarnatus,
„ candicans, *L.*
„ Laburnum, *L.*
β. involuta,

Cytisus Ratisbonensis,
,, subspicatus,
,, virgatus,
Parochetus communis, *Ham.*
Goodia latifolia, *Salisb.*
,, medicaginea,
Medicago scutellata, *All.*
Anthyllis vulneraria, *L.*
Carmichaelia australis,
Trifolium hybridum, *Savi.*
,, incarnatum, *L.*
,, repens, *L.*
Lotus corniculatus, *L.*
Psoralea acaulis, *Stev.*
,, bituminosa, *L.*
,, verrucosa, *Willd.*
Galega officinalis. *L.*
Wistaria chinensis, *DC.*
Robinia Pseudo-acacia, *L.*
Clianthus puniceus.
Swainsonia Greyana.
Astragalus falcatus, *Lam.*
,, physodes, *L.*
,, sulcatus *L.*
Desmodium argenteum, *Wall.*
Vicia grandiflora, *Scop.*
,, picta.
Lathyrus Bithynicus, *Lam*
,, odoratus.
,, pratensis, *L.*
,, sylvestris, *L.*
,, tuberosus, *L.*
Orobus atropurpureus, *Desf.*
,, lathyroides, *L.*
,, tuberosus *L.* var: tenuifolius, *Roth.*
Kennedya rubicunda, *Vent.*
Kennedya sp.
Hardenbergia macrophylla.
Mucuna multiflorus, *Willd.*
Phaseolus coccineus.
,, Zebra carnea.
Acacia armata, *R. Br.*
,, chordiophylla.
,, decipiens, *R. Br.*
,, dealbata, *Link.*
,, La Trobii.
,, leiophylla.
,, melanoxylon. *R. Br.*
,, myrtifolia, *Willd.*
,, oxycedrus, *Sieb.*
,, prominens, *cun.*
,, sophoræ, *R. Br.*
,, sp.
,, vestita, *Ker.*

ROSACEÆ.

Prunus Nepalensis, *Benth. et. H. f.*
,, Puddum, *Benth et. H. f.*
Maddenia Himalaica, *Hf. et. T*
Spiræa chamædrifolia, *Linn.*
,, confusa, var. mollis.
,, cuneifolia, *Wall.*
,, cantoniensis, *Lour.*
,, nutans.
,, ulmifolia, *Scop.*
Kerria Japonica, *DC.*
Rubus asper *Don.*
,, acuminata, *Sm*
,, betulinus, *Don.*
,, biflorus, *Buch.*
,, calycinus, *Wall.*
,, distans.
,, ellipticus, *Sm.*

Rubus flavus, *Ham.*
,, foliolosus *Don.*
,, gracile, *Roxb.*
,, Hamiltonianus, *Sm.*
,, micranthus *Don.*
,, parviflorus, *Wall.*
,, paniculatus, *Sm.*
,, rosæfolius, *Sm.*
,, tiliaceus, *Sm.*
Geum intermedium *Bess.*
,, Japonicum, *Thunb.*
,, macrophyllum, *Willd.*
Fragaria indica, *Andr.*
Potentilla norvegica, *L.*
,, sp.
,, sp.
Alchemilla arvensis, *Scop.*
Agrimonia nepalensis, *Don.*
Poterium mucronatum,
Rosa Banksiæ, *R. Br.*
,, Brunonii, *Lindl.*
,, cinnamomea, *Best.*
,, canina, *L.*
v. dumetorum *Don.*
,, indica, *L.*
,, macrophylla, *Lindl.*
,, rubiginosa *L.*
,, tomentosa, *Smith.*
Pyrus Malus, *L.*
,, sinaica, *Thouin.*
Eriobotrya Japonica, *Lindl.*

SAXIFRAGACEÆ.

Astilbe rivularis, *Ham.*
Saxifraga aizoon, *Jacq.*
,, nivalis, *L.*
Chrysosplenium Nepalense, *Don.*
Hydrangea altissima, *Wall.*
,, Hortensia, *DC.*
Dichroa cyanea,
Deutzia scabra,
Philadelphus coronarius, *L.*
Ribes nigrum, *L.*
,, rubrum, *L.*

CRASSULACEÆ

Kalanchoe, sp.
Bryophyllum sp.

HAMAMELIDEÆ.

Bucklandia populnea, *R. Br*

MYRTACEÆ.

Melaleuca acuminata,
,, decussata, *R. Br.*
Callistemon fulgidum,
,, linearis, *DC.*
,, lanceolatum, *DC.*
,, rugulosom, *DC.*
,, rigidum, *R. Br*
,, salignum, *DC.*
Eucalyptus globulus, *Labill.*
,, viminalis, *Labill.*
Leptospermum attenutum, *Sm.*
,, aciculare, *Schauer.*
,, Cunninghamii.
,, Juniperinum, *Smith.*
,, scoparium, *Smith.*
,, stellatum. *Cav.*
Fabricia lævigata, *Gartn.*
Myrtus communis, *L.*

MELASTOMACEÆ.

Osbeckia,
Melastoma,

LYTHRACEÆ.

Lythrum salicaria, *L.*
Cuphea platycentra, *Bth.*
„ purpurea,

ONAGRARIACEÆ.

Fuchsia gracilis, *Lindl.*
„ macrostemma, *Ruiz et. Pav.*
Epilobium brevifolium, *Don.*
„ cylindricum, *Don.*
„ latifolium, *L.*
„ roseum, *DC.*
„ tetragonum, *L.*
Œnothera acaulis, *Cav.*
„ bistorta.
„ coccinea.
„ Drummondii, *Hook.*
gauroides, *Ham.*
„ Lamarkiana, *Ser.*
„ mollissima, *L.*
„ macrantha,
„ parviflora,
„ undulata,
Clarkia pulchella, *Pursh.*

PASSIFLORACEÆ.

Passiflora cœrulea, *L.*
„ edulis, *Sim.*
„ minima, *Jacq.*
Disemma coccinea,

LOASACEÆ

Cajophora lateritia,

CUCURBITACEÆ.

Zanonia indica,
Bryonia dioica, *Jacq.*
Hodgsonia heteroclita, *Hf. & T.*
Cucumis.
Cyclanthera pedata, *Schrad.*

BEGONIACEÆ.

Begonia argyrostigma,
„ Cathcartii, *Hf.*
„ hydroctylifolia, *Hook.*
„ longipes, *Hook.*
„ malabarica,
„ picta, *Sm.*
„ platanifolia, *Schott.*
„ rubro venia, *Hook.*
„ reniformis, *Dryand.*
„ sp.
„ sp.
„ sp.
„ sp.

FICOIDEÆ.

Mesembryanthemum crystallinum, *L.*
„ cordifolium.
„ sp.

UMBELLIFERÆ.

Didiscus cœruleus, *Hook.*
Oreocome, sp.
Heracleum nepalense, *Don*
Sanicula Europæa, *L.*

ARALIACEÆ.

Hydrocotyle asiatica,
„ Nepalensis, *Hook.*
„ sp.
Panax Pseudo Ginsang, *Wall.*
„ sp.
„ sp.
„ sp

Panax sp.
Hedera æsculifolia, *Wall.*
,, Helix, *L.*
,, polyacantha, *Wall.*
Helwingia rusciflora,

CORNACEÆ.

Cornus macrophylla,
,, sp.
Acuba Himalayana,

CAPRIFOLIACEÆ.

Sambucus Javanica, *Reinw.*
,, nigra, *L.*
Viburnum sp.
,, sp.
,, sp.
Lonicera Japonica, *Thunb.*

RUBIACEÆ.

Hymenopogon parasiticus, *Wall.*
Cinchona Calisaya, *Wedd.*
,, micrantha, *R. et P.*
,, officinalis, *L.*
,, *var.* Bonplandiana,
,, *var.* condaminea.
,, Pahudiana, *Howard.*
,, succirubra, *R et P.*
Luculia gratissima, *Sweet.*
Mussænda sp.
Gardenia florida, *L.*
Ophiorriza, sp.
Coffea arabica, *L.*
Rubia munjista, *Roxb.*
Galium asperifolium, *Wall.*

VALERIANACEÆ

Valeriana Wallichii, *DC.*
Scabiosa atropurpurea, *L.*

COMPOSITÆ.

Ageratum conyzoides, *L.*
Adenostemma sp.
Mikania clematidea, *DC.*
Aster,
Biotia macrophylla, *DC.*
Eurybia lepidophylla, *DC.*
,, ramulosa, *DC.*
Bellis perennis, *L.*
Grindelia squarrosa, *Dunal.*
,, lanceolata, *Nutt.*
Inula Helenium, *L.*
,, salicina, *L.*
Dahlia Mackii,
,, variabilis, *Desf.*
Siegesbeckia orientalis, *L.*
Zinnia elegans, *Jacq.*
Obeliscaria pulcherrima, *DC.*
Calliopsis auriculata,
,, cardaminefolia, *DC.*
Bidens Wallichii, *DC.*
Tagetes erecta, *L.*
,, patula, *L.*
,, signata,
Gaillardia Drummondii, *DC.*
Guntheria viscosa,
Anthemis tinctoria, *L.*
Ptarmica vulgaris, *Blackw.*
Achillea dentifera, *DC.*
,, filipendula, *Lam.*
β. Eupatoria,
,, magna, *L.*
Leucanthemum vulgare, *Lam.*
Matricaria inodora, *L.*
Pyrethrum carneum, *Bieb.*

Pyrethrum indicum, *Cass.*
,, niveum, *Lag.*
,, Parthenium, *Sm.*
,, sinense, *Sabin.*
Chrysanthemum acaule,
,, Broussonetii, *Balb.*
,, coronarium, *L.*
,, ,, *var.* luteum plenum,
,, fœniculaceum *DC.*
,, fistulosum,
,, segetum, *L.*
Cotula coronopifolia, *L.*
Lonas inodora, *Gærtn.*
Artemisia abrotanum, *L.*
,, indica, *Willd.*
Ammobium alatum, *R. Br*
Rhodanthe Manglesii, *Lindl.*
Ozothamnus retusus,
Gnaphalium sp.
,, sp.
,, sp.
Arnica chamissonis, *L.*
Doronicum caucasicum, *Bieb.*
Senecio elegans, *L.*
,, maritimus, *L.*
,, orientalis, *Willd.*
,, sylvaticus, *L.*
,, vulgaris, *L.*
Calendula officinalis, *L.*
Centaurea cyanus, *L.*
,, nigra, *L.*
,, sonchifolia, *L.*
Cynara scolymus, *L.*
Lappa grandiflora,
Ainsliæa aptera, *DC.*
,, pteropoda, *DC.*
Leucomeris spectabilis, *Don.*
Lapsana communis, *L.*
Cichorium Intybus, *L.*
Hypochæris radiata, *L.*
Sonchus Wallichianus, *DC.*
Youngia runcinata, *DC.*
Prenanthis,
Hieracium, murorum, *L.*

LOBELIANÆ.

Piddingtonia nummularia, *DC.*
Lobelia Erinus, *L.*
,, *var.* Paxtoni,
,, ,, marmorata,
,, ,, rosea,
,, pyramidalis, *Wall.*

CAMPANULACEÆ.

Jasione montana, *L.*
E. major,
Codonopsis sp.
Campanula fragrans,
,, medium, *L.*
,, pyramidalis, *L*
,, rapunculoides, *L.*
,, rapunculus, *L.*
,, sp.
Phyteuma Scheuchzeri, *All*

GESNERACEÆ.

Gesnera tubiflora, *Cav.*
Achimenes sp.
Gloxinia maculata, *L. Her.*
,, sp.

VACCINACEÆ.

Gaylussacia salicifolia, *Cham. et. Schlech.*

Agapetes, sp.
Vaccinium, sp.

ERICACEÆ.

Gaultheria sp.
Rhododendron argenteum, *Hook. fil.*
" arboreum, *Sm.*
" anthopogon, *Don.*
" Dalhousiæ, *Hook. fil.*
" Edgeworthii, *Hook. fil.*
" Falconeri, *Hook. fil.*

LENTIBULARIACEÆ.

Utricularia,

PRIMULACE.

Primula elatior, *Jacq.*
" sinensis, *Lindl.*
Cyclamen Coum, *Mill.*
Lysimachia lobelioides,
" ramosa, *Wall.*

MYRSINACEÆ.

Maesa ramentacea, *Wall.*
Choripetalum undulatum, *A. DC.*
Ardisia crenulata, *Vent.*

STYRACEÆ.

Symplocos,

OLEACEÆ.

Jasminum fruticans, *L.*

APOCYNACEÆ.

Chonemorpha macrophylla *G. Don.*
Vinca major, *L.*

ASCLEPIADACEÆ.

Hoya Bella.
" sp.

GENTIANACEÆ.

Gentiana depressa, *Don.?*
Crawfordia fasciculata, *Wall.*
" speciosa, *Wall.*
Ophelia chirata, *Griseb.*
" sp.

CYRTANDRACEÆ.

Aeschynanthus Peelii, *Hook. fil.*
Lysionotus ternifolia, *Wall.*
Didymocarpus, sp.
" sp.
Streptocarpus Gardneri.
" polyanthus,
Chirita macrophylla, *Wall.*
" urticæfolia, *Ham.*
Rhynchoglossum obliquum, *DC.*

HYDROPHYLLACEÆ.

Nemophila insignis, *Benth.*

POLEMONIACEÆ.

Leptosiphon sp.
Polemonium cœruleum, *L.*

CONVOLVULACEÆ.

Ipomœa sp.
Convolvulus tricolor, *L.*

BORRAGINEÆ.

Tournefortia, *L.*
Heliotropium Peruvianum, *L.*
Cynoglossum sp.
" sp.

SOLANACEÆ.

Nicotiana Persica,
Nicotiana Tabacum, *L.*
Datura fastuosa, *L.*
Schizanthus grandiflorum,
,, retusus,
Salpiglossis Barclayana,
Browallia Czemiatowosky,
,, demissa,
Petunia phœnicea,
,, violacea, *L.*
,, nyctaginiflora,
Hyoscyanus alba, *L.*
,, nigra, *L.*
Atropa Belladona, *L.*
Physalis nicandra,
,, peruviana,
Capsicum annuum,
Solanum Dulcamara, *L.*
,, Sodomæum,
,, utile,

SCROPHULARINEÆ.

Calceolaria scabiosæfolia, *R. et.* S.
Verbascum pulchrum,
,, pulverulentum, *Vill.*
,, phœnicum, *L.*
,, Thapsus, *L.*
Celsia cretica, *L.*
Alonsoa linearis, *R. et. P.*
Linaria bistorta,
,, sp.
Antirrhinum majus, *L.*
Maurandia Barclayana, *Lindl.*
Lophospermum erubescens, *Zucc.*
Paulownia imperialis, *Sieb, et Zucc.*
Wightia gigantea, *Wall.*
Scrophularia scorodonia, *L.*
Mimulus cardinalis, *Dougl.*
,, moschatus, *Dougl.*
,, maculatus,
,, nepalensis, *Benth.*
,, orbicularis, *Wall.*
,, punctatus,
,, tigridoides,
Mazus surculosus, *Don.*
Torenia diffusa, *Don.*
Digitalis lutea, *L.*
,, purpurea, *L.*
Veronica syraica, *R. et. S.*

ACANTHACEÆ.

Thunbergia coccinea, *Wall.*
,, lutea. *T. Andr.*
Strobilanthes divaricatus, *T. Andr.*
,, Helictus, *T. Andr.*
,, inflatus, *T. Andr.*
,, maculatus, *N. ab. E.*
,, pectinatus, *T. Andr.*
,, secundus, *T. Andr.*
,, Thomsoni, *T. Andr,*
,, urophyllus, *Nal. Æ.*
,, Wallichii, *Nal. E.*
Acanthus mollis, *L.*
Justicia collina, *T. Andr.*

VERBENACEÆ

Verbena Aubletia, *L.*
,, Bonariensis, *L.*
,, pulcherrima,
,, venosa, *Gill et. Hook.*
Lantana Sellowiana, *Link &. Otto.*

Lippia citriodora, *H. B. K.*
Eremophila longifolia,

LABIATÆ.

Lavandula Spica, *DC.*
,, vera, *DC.*
Pogostemon patchouly, *Pell.*
Mentha sylvestris, *L.*
,, viridis, *L.*
Salvia argentea, *L.*
,, coccinea, *L.*
,, clandestina, *L.*
,, sclarea, *L.*
,, virgata, *Ait.*
Origanum majorana, *L.*
,, vulgare, *L.*
Thymus serpyllum, *L.*
Hyssopus officinalis, *L.*
Calamintha umbrosa, *Benth.*
Prunella vulgaris, *L.*
Scutellaria Japonica, *Morr. et. Dcne.*
,, pallida,
Nepeta grandiflora, *Bieb.*
,, Cataria, *L.*
,, Mussinii, *Henk.*
,, Nepetella,
,, Teydea, *Webb.*
Lamium purpureum, *L.*
Leonurus glaucescens, *Bunge.*
Stachys alpina, *L.*
,, var. intermedia,
,, lanata, *Jacq.*
Marrubium vulgare, *L.*
Ballota nigra, *L.*
Teucrium Pseudo scordonia, *Desf.*
,, scordonia, *L.*

Ajuga reptans, *L.*

PLUMBAGINEÆ.

Statice tatarica. *L.*

PLANTAGINACEÆ.

Plantago cornopus, *L.*
,, lanceolata, *L.*
,, maritima, *L.*

NYCTAGINEÆ.

Mirabilis jalapa, *L.*

PHYTOLACCACEÆ.

Phytolacca decandra, *L.*

POLYGONACEÆ.

Rheum, sp.
Rumex aquaticus, *L.*
,, acetosella, *L.*
,, crispus, *L.*
,, Marschallianus, *Reich.*
,, obtusifolius, *L.*
,, sanguineus, *L.*
Polygonum amplexicaule, *Don.*
,, aviculare, *L.*
,, convolvulus, *L.*
,, elegans, *Ten.*
,, Hamiltonii, *Spr.*
,, molle, *Don.*
,, petiolatum, *Don.*
,, patens, *Don.*
,, runcinatum, *Hm. Mss.*
,, Sanguineus, *L.*

AMARANTHACEÆ.

Amaranthus caudatus, *L.*

Amaranthus cruentus,
B. variegata,
„ frumentaceus,
„ hypochondriacus,
„ melancholicus
„ sanguineus.

PROTEACEÆ.

Hakea carinata, Müll.
„ saligna, *Kn. et Salisb.*
„ undulata, *R. Br.*

THYMELEACEÆ.

Daphne papyracea, *Wall.*

LAURACEÆ.

Laurus nobilis, *L.*

URTICACEÆ.

Urtica dioica, *L.*

EUPHORBIACEÆ.

Euphorbia Pithysesa,
Phyllanthus calycinus,
Cœlobogyne ilicifolia, *J. Smith.*
Ricinus communis, *L.*

AMENTIFERÆ.

Salix Babylonica, *L.*

CASUARINACEÆ.

Casuarina leptoclada,
„ quadrivalvis, *Lah.*

CONIFERÆ.

Pinus Douglasii, *Sab.*
„ Banksiana, *Lamb.*
„ Decorte,
Pinus excelsa, *Wall.*
„ Gerardiana, *Wall.*
„ longifolia, *Roxb.*
„ Massoniana, *Lamb.*
„ Pinaster, *Soland.*
„ „ maritima,
„ „ limonia,
„ pendula, *Soland.*
„ sylvestris,
„ „ *var.* Mugho,
Abies Smithiana,
„ Webbiana, *Lindl.*
Larix Griffithii, *Hf.*
Juniperus recurva, *Ham.*
Thuja orientalis, *L.*
Cryptomeria japonica, *Don.*
Cupressus funebris, *Endl.*
„ Goveniana, *Gord.*
„ Lawsoniana,
„ sp. Mexico.
„ torulosa, *Don.*
Sequoia gigantea, *Lindl.*

PALMEÆ.

Corypha australis, *R. Br.*
Chamærops Fortunei, *Hook.*
Plectocomia himalayiana, *Griff.*

AROIDEÆ.

Richardia æthiopica,

ORCHIDACEÆ.

Cyprepidium Venustum. *Wall.*

MUSACEÆ.

Musa. sp.

IRIDEÆ.

Sisyrinchium anceps,
Morea speciosa,
Iris aquilcba,
,, flavescens,
,, Guldenstadti,
,, Nepalensis *Don.*
,, variegata,
,, Virginica,
Pardanthus chinensis, *Ker.*
Galaxia ovata,
Anomatheca sp.
Babiana flava,
,, plicata,
,, rubro—cyana,
,, rubra,
,, ringens,
,, sp.
Gladiolus albus,
,, Natalensis,
,, Viperectus,
,, Watsonius,
Antholyza æthiopica,
Ludwigia sp.
Watsonia curvifolia,
,, humilis,
,, marginata,
,, rosea,
,, sp.
,, variegata,
Sparaxis bicolor,
Tritonia crispa,
,, longiflora,
Ixia ciliaris,
,, flava,
,, fragrans,
,, patens,
Ixia rosea,
,, sp.
,, variegata,

AMARYLLIDEÆ.

Amaryllis sp.
Zephyranthes rosea, *Lindl.*
Narcissus Jonquilla,
,, Tagetta, *L.*
Crinum Smithii,
Agave americana, *L.*
β variegata,

LILIACEÆ

Lilium giganteum, *Wall.*
,, longiflorum, *Thunb.*
,, sp.
Hemerocallis fulvum,
Agapanthus umbellatus *L. Her.*
Tritoma crocata,
Scilla sp.
Ornithogalum caudatum, *Ait.*
,, niveum, *Ait.*
Lachenalia tricolor, *Thunb.*
Arthropodium paniculatum, *R. Br.*
Asparagus sp.
Polyganatum, sp.
Smilacina, sp.
Ophiopogon, sp.
Peliosanthus, Teta, *Andr.*

COMMELYNEÆ.

Commelyna, sp.
Tradescantia virginica, *L.*
Cyanotis, sp.
Streptolirion volubile, *Edgw.*

JUNCACEÆ.

Luzula campestris, *Br.*

CYPERACEÆ.

Cyperus, sp.

GRAMINEÆ.

Ehrhartia paniculata, *Pitr.*
Zea mais, *L.*
Coix lachyrma, *L.*
Crypsis aculeata, *Ait.*
,, schœnoides, *Lam.*
Phleum pratense, *L.*
Phalaris canariensis, *L.*
Holcus lanatus, *L.*
,, mollis, *L.*
Milium effusum, *Linn.*
Panicum miliaceum,
,, sanguinale, *L.*
Agrostis alba, *L.*
,, vulgaris, *With.*
Arundo Donax, *L.*
var: versicolor,
Ammophila arundinacea, *Host.*
Eleusine coracana, *Gærtn.*
,, Indica, *Gærtn.*
Anthoxanthum odoratum, *L.*
Aira præcox, *L.*
Lagurus ovatus, *L.*
Avena fatua, *L.*
,, nuda, *L.*
,, orientalis, *Schub.*
,, sativa nigra,
,, sativa, *L.*
,, strigosa, *Schreb.*
Arrhenatherum avenaceum, *Beauv.*
Poa annua, *L.*
Briza maxima, *L.*
Dactylis glomerata, *L.*
Cynosurus cristatus, *L.*
Festuca gigantea, *Vill.*
,, unioloides,
Bromus mollis, *L.*
Lolium Bouchianum, *K.*
,, perenne, *L.*
Triticum spelta, *L.*
,, vulgare, *Vill.*
Elymus hystrix,
Hordeum distichum, *L.*
,, hexastichum, *L.*
,, Zeocriton, *L.*

Notes of a tour in the Punjab Salt Range, with some account of its Flora. By JOHN LINDSAY STEWART, M. D.

Prefatory. In the notes of a Botanizing tour in Huzara which the Agri. Horticultural Society did me the honor to publish in their Journal in 1865, (Vol. XIV.) I made a remark implying that the Flora of the Salt Range was likely to prove both scanty and uninteresting. In adopting this opinion I was chiefly influenced by the remarks of Dr. Fleming in his account of the Geology of the Range. But circumstances have since induced me to modify that view, and I now have the pleasure to put before the Society some account of the Salt Range Flora, with notes of a tour I had occasion to make along its extent in the early part of 1865. With the results of my own observations I have incorporated whatever seemed suitable in Dr. Fleming's Report on the Geology of the Range in the Journal of the Asiatic Society of Bengal, and in Mr. Bowrings's account of Jhelum in that Journal,—as well as many of the data in Dr. Aitchison's two valuable papers on the Flora of the Jhelum district in the above Journal, and in that of the Linnæan Society. Dr. Aitchison's botanizing was confined to the Eastern part of the Range and I am indebted to him for a nearly complete set of his plants. Dr. G. Henderson botanized pretty thoroughly the central or Sakesar part of the Range, during a residence of some years at Shahpore, and has obliged me with a set of his plants and much information regarding them. I am also indebted for various information to the Settlement Reports of Jhelum and Shahpore by Mr. A. Brandreth and Capt. W. G. Davis, and to notes furnished by Col: J. W. Bristowe, Depy. Comr. of Jhelum.

Dr. Fleming.

Dr. Aitchison.

Dr. Henderson.

The Range generally.

The Great Salt Range of the Punjab, called the hills of Jodh by Baber and other early historians, runs across the Sind Saugor Doab from the Indus at Mári to near the Jhelum in the neighbourhood of the town of that name. Speaking generally it lies between 71. 30 and 73. 30 E. Long: and 32. 20 and 30 N. Lat: It may be described as curved in rough semicircle with the convexity towards the South, but the greater part of the curve is in the Western half, the Eastern part running more nearly straight East and West. The Range is single from Mari eastwards for 3/4 of its length. At that point, from a sort of nucleus, the Chel or Drengan hill, a north-eastern branch, the Bukrála or Nili is given off. The main range may be held as continued into the Rhotás or Ratián ridge running nearly parallel with that of Bukrala; and the Pubbee or Kharián range cis-Jhelum, though not continuous with, is a branch of the same system. I need not here do more than allude to the geological continuations of the Range Trans-Indus beyond Kalabagh which run into the great Sulimán group.

Geology of the Range

The geological structure of the Salt Range has been fully detailed by Dr. Fleming and may briefly and generally be put thus, passing from South to North, from the older to the newer strata, the Southern face of the Range from near Jhelum to close to Mari, is almost without exception composed of various Devonian rocks, comprising chiefly sandstone, conglomerates, and the red marl whence is extracted the Punjab rock salt. Next this in the western half of the Range is a well-developed carboniferous belt, consisting chiefly of limestones with some sandstone and shales. Within this in the most western third of the Range is a narrow oolitic belt consisting principally of sandstones and shales. Then comes an Eocene tract extending the whole length and often of considerable breadth, of which the chief member is nummulitic limestone. And along the whole northern face, stretch beds of great thickness probably of miocene age, and comprising grits, conglomerates and clays. These are overlaid by the alluvium of the table-land which stretches as Potwár away to the northward of the Range.

Its Structure

Westward from about Bághanwála, ten or twelve miles from the Jhelum at Jelalpore, the Range is composed as it were of two sets of ridges for 75 miles to Sakesar in the Shahpore district. This leads to a tolerably natural division of the whole throughout most of its length into three belts, southern, middle and northern. The Southern belt consists chiefly

Southern belt.

of the sand-stone or red salt-bearing strata, mostly very bare of vegetation and frequently over-topped especially in the central part of the range by high escarpments of the limestone rocks, rising in places into crests of many hundred feet above the plain at the foot of the Range. Through these cliffs there are frequent gorges giving issue to streams which are soon absorbed in the debris or used up in irrigating small patches of cultivation, where the water has not been rendered too salt by passing through or over the saliferous strata. In the plain immediately to the south, especially for some distance west of Pind Dádan Khán lies a barren saline tract with *Salsolaceæ*, *Tamarisk*, *Salvadora*, *Zizyphus nummularia* and a few other characteristic plants. Further south still in the eastern part lies the fertile alluvial belt along the river, and in the west, the arid tract towards the centre of the Doāb, called the *Bār*, which is but scantily furnished with *Salvadora*, *Capparis aphylla* and *Prosopis*.

Middle belt.

The middle belt of the Range included between the Northern and Southern more elevated portions, contains many picturesque spots and is of importance, as it is largely cultivated and being very fertile supports a considerable population. The soil somewhat resembles the alluvium of our rivers but contains more sand from the disintegration of the sand-stone of the Range. It is often, especially towards the west, a rich loam, and is for the most part fertilized by the calcareous matter washed by the drainage from the hills lying mostly to the south. Almost the whole of the cultivation depends for moisture upon rain-fall and fields are reckoned of greater or less value according as they receive a larger or smaller amount of the vivifying and fertilizing drainage. By various cross-ridges and scattered hills this middle belt is divided into different tracts varying from 2,000 to 2,500 feet above the sea. The most easterly of these is Jhangar or Bishārat, and the next Kahún which together extend over some 25 miles in length of the Range, at a part where it averages in all 10 or 12 miles in width. Next to the west is a part called Vunhár some 15 or 20 miles long where the range is narrower and the middle belt more hilly, with smaller portions of cultivation interspersed. Beyond to the west, is the smaller tract of Khabakki continued into Son Sakesar, each with a small lake. Son Sakesar is about 12 miles long by 3 broad, is the richest of the whole of these tracts, and is looked down upon from the west by Sakesar, the highest peak in the whole Range, reaching upwards of 5,000 feet above the sea. Beyond this to the Indus the Range becomes much narrower consisting of series of ridges without intervening flats. And at Sakesar terminates the middle belt which in various parts is traversed by small streams giving moisture in places to a considerable amount of arboreous and other vegetation. The arid ridges in this belt are for the most part but scantily clothed with *Adhatoda, Dodonœa, Buxus* &c., except at greater elevations with respect to the vegetation of which details will by and bye be given.

Northern belt

The Northern belt consists chiefly of tertiary ridges of soft sandstone and clay, scarped to the South and dipping towards the North under the southern continuation of the Potwár plain. In this belt there are frequent deep ravines with but little level or cultivated land. It is for the most part narrow, but in the extreme west towards Mari spreads in a fan-like shape to 16 miles in width. The natural vegetation of this is similar to, but still more scanty than that of the middle belt. The plain of Tullagung and Chakowál to the north of the Range averages 1,000 or 1,200 feet above the sea. It is mostly very arid, containing but few trees and almost no herbage except in moist ravines, where *Dalbergia Sissoo (tāli)* is abundant, and grass is not uncommon. Between the Bukrála and Rhotás ranges to the east, lies the Doomeli tract which is take advantage of all the drainage water from the higher parts, for the right to utilize which there are often fierce contentions. Hedges except close to huts, or for the penning of cattle, are almost unknown. Two-thirds of the cultivation is said to be of the cold weather *(rabi)* and consists chiefly of wheat with a little barley. Owing to the richness of the soil the former is particularly fine and heavy and in Son. Sakesar 62 per cent of the cultivated area is stated to be of this crop. Captain Davies mentions that in good *hail* (the best kind of soil) the average produce of wheat is 16 maunds per acre, while 32 maunds per acre was in some instances found by actual experiment. If there is no mistake here, and these were *pakka* maunds of 80 lb. this is enormous for the Punjab, though Mr. Mechi of Tiptree Hall would not think much of it.

Cold weather crop

The hot weather crop consists chiefly of *bājra* (Penicillaria spicata) as in many parts of the North Western Punjab. It is well-adapted for *barānī* cultivation, but is held to be less nutritious and more heating than other grains. Some *til* (Sesamum) and *Mūng* (Phaseolus Mungo) also are cultivated. The quantity raised of all of these is probably not more than sufficient for the wants of the resident population. Some Brassica Campestris *(Sarson)* is grown, and Brassica Eruca, rape *(Kāla sarson, tára míra)* is frequently raised on the dry banks between the fields of other crops. The few wells consist of shallow pits within or close to the margin of some water course and generally utilized for small plots of ground highly cultivated with vegetables &c., by the Maliárs a gardening tribe. Cold comes on too early in the season for cotton to be cultivated with success in the Range, although small quantities of good quality are raised for local consumption in the plains both to north and south. The plain to the north of the Range is the best tract in the Punjab for Cicer arietinum (here called *chola*) but it is very rarely

Hot weather Crop.

Other crops.

cultivated in the Range; I saw only one field of it. The poppy is cultivated for opium in two places. There is too little facility for irrigation for either sugarcane or rice, although both are cultivated to some extent along the Jhelum to the south, as are also Indigo and Safflower. Much of the wealth of the inhabitants of the Range and neighbourhood consists of immense flocks of sheep, which with cattle, camels, and goats browse the shrubs, and crop the herbage which after rain comes up in some quantity on these hills.

General remarks on vegetation

I may preface the notes of my own tour with the following general remarks as to some statements regarding the general indigenous vegetation made by previous observers. The altitude of even the highest part of the Salt Range is by no means sufficient to warrant us in expecting any of the "indications of an alpine flora" on the absence of which Dr. Fleming remarks. It will also be seen by and bye how wide of the mark is his statement as to the "want of any of the ordinary trees characteristic of the sub Himalayan ranges" And although the arboreous vegetation is generally by no means luxuriant except in low moist spots, his remark is not *quite* correct that there is nothing deserving the name of a tree on the Salt Range from the Jhelum to the Indus. Dr. Aitchison again appears to me to err as far on the other side in stating that "the ridges themselves of the Range are covered with a thickly wooded jungle," and that in such favourable low places as are above alluded to "we come on a herbage of luxuriance only to be met with in a tropical climate." For even in such spots the luxuriance is generally by no means appalling. And except in these and in particular places after attaining a considerable elevation, the arboreous and shrubby vegetation is usually very scanty, while many of even the limestone ridges, present a very unverdant appearance, while those of sandstone, and above all of the saliferous strata are frequently hideously bare. I am however disinclined to believe that the destruction of tree and shrub on the Range has been comparatively so excessive under our rule as Mr. Brandreth would make out. He states as results of this denudation that "rain has undoubtedly grown scarcer while owing to the want of shade there is no grass," that the bare nummulitic limestone gets intensely heated and gives rise to fierce hot winds which dry up the crops and drive off the rain-clouds. I by no means deny that such results will to some extent accrue from excessive denudation of such ridges, but I very much doubt if the denudation of the Salt Range has at any time since annexation been very much greater than it was before. This is however no reason why more effective means should not be adopted for preserving what trees and shrubs do grow here, but this is hardly the place for indulging in a disquisition on so technical a subject.

Notes of tour.

Island at Jhelum.

Tāli plantation.

I shall now proceed to give notes of my tour which commenced on 16th March 1865. On the morning of that day I visited Sāila *bela* (island) situated in the river nearly opposite the Jhelum Cantonment, with the object of examining a plantation of *tāli* formed by Mr. E. Thornton when Commissioner of the Division. The whole of the island (with one or two other similar places in the neighbourhood) had been sown about 1853 and when I saw it was fairly well covered with trees. These averaged about 20 to 24 inches in girth, which although the soil is good with apparently no detrimental substratum of shingle or sand, is somewhat under the average growth of the tree for that age. In such situations as this are the largest *tālī* forests in Northern India and the idea of afforesting these islands was a good one. The drawback to such places is that many of them are subject to great erosion or even being swept away by the river. About one third of this island is said to have been so eroded within these twelve years. Of indigenous trees on the island Salix tetrasperma and S. Babylonica (both called *bed*) were common. Zewxine sulcata was abundant in places. There were also some thriving plants of a good many trees and shrubs which are not ordinarily indigenous in this part of the Punjab at this height, (about 650 feet above the sea), and of which the seeds have probably been brought down by the river from greater attitudes. These were Bombax heptaphyllum, Ficus glomerata, Buddleia crispa, Mussaenda sp., Grislea tomentosa, and Nussiessya hypoleuca.

To Dariāla.

In the afternoon I went on to camp at Dariāla, seven miles West from Jhelum rising some hundreds of feet up a well-cultivated slope with but little waste-land. The chief trees at villages &c., were Zizyphus Jujuba (*ber*) and Acacia Arabica (*kikkar.*) The cupressiform variety of the latter was less common than the ordinary one.

Towards Tilla across Rhotās ridge.

On 17*th* March, 16 miles southwest to the top of Tilla. My traps followed the road to Bhet at the foot of Tilla while I crossed the low Rhotās range to examine its vegetation before getting on the road to the former. Cultivation was soon left behind and a narrow tract much cut up by ravines was crossed before entering on the range. The latter may here reach 1,800 feet and consists mostly of arid sandstone ridges with some conglomerate. The Flora is generally scanty both as to number of species and of individuals and most of the few shrubs are much lopped and browsed down. Acacia eburnea (*kikri*) was one of the commonest. It resembles very much a miniature A. Arabica and was probably in some instances mistaken by Dr. Aitchison for the latter, which is no where indigenous in absolute jungles here, while A. eburnea is common all over the Range. Gymnesporia spinosa (*patākī*), Grewia betulæfolia (*gangėr*) the fruit of which is eaten, and Periploca aphylla (*bāta*) the buds of which are used in pickle, were all abundant, one or two plants of Carissa diffusa (*garinda*) were seen and Adhatoda Vasica *(bhekkar)* covered the western face of the range. These may be taken as a fair sample of the ordinary vegetation of such low ranges. Butea frondosa *(chichra)* was abundant in the bed of the brook by which I left the ridge to join the road to Bhet, and Dalbergia was common at and near villages.

Ascent of Tilla

The village of Bhet lies close to the foot of the ascent to Tilla from the west, at an elevation of about 1,500 feet above the sea. Europeans almost always ascend by this, the easiest route, but there are paths to the south and down the steep eastern scarp also. I may here premise that on the vegetation of Tilla I found no such marked difference from that at similar elevation in other parts of the Range, as Dr. Aitchison would infer. Still it is unquestionable that there are both more species and more individuals on Tilla than at similar heights elsewhere, this probably depending on causes to be alluded to by and bye. From the foot to the top of the hill Gagea lutea was common in many places. For the first two thirds of the way, the ascent is pretty steep by a fair path for the most part up a ravine. The hill is chiefly composed, so far as we are concerned, of grey dolomitic sandstone. The more rocky and steep parts even on this (the west) side of the hill are rather bare, but there is a good deal of shrubby vegetation in the ravines, and in some places a considerable number of trees, especially towards the upper part. Adhatoda is the most common plant to halfway up where it gives way to an abundance of Ballota limbata *(awānī būt)* and Plectranthus rugosus. Adiantum caudatum is common on rocks quite near the base. Acacia modesta *(phulāh)* is or has been abundant from low down, but although injury to the shrubs, &c., is, I am told, prohibited, many of the trees are pollarded, there was evidence of fresh felling and lopping of this, Acacia speciosa *(sirīn)* Bombax heptaphyllum, *(semal)* and Grewia oppositifolia *(dhaman)*, and as I ascended a man was engaged cutting a tree. Olea

Europea (*káu*) is common from near the base to the summit of the hill. From one-third up, Colebrookia oppositifolia (*phís-bhekkar*) was occasional, and Rottlera tinctoria (*kamela*) not uncommon. A little higher Kydia Calycina (*púla*) occurred in the ravine, and it was occasional over the higher part of the hill. Pistacia (Rhus) integerrima (*kakkra*) and Phænix sylvestris (*khajúr*) were also met before the termination of the steeper part of the ascent, after which the path lies for a mile in a hollow running south-westerly along the upper part of the hill, until just at the end when it rises to near the summit of the higher crest on the west of the hollow. Over most of the lower portions of this part, as well as on some of the ridges on either side, there is a good deal of herbaceous and shrubby vegetation and a considerable sprinkling of trees to be noted immediately.

Tilla.

I put up in a small bungalow built by Government for the use of District officers near the summit of the hill at fully 3,200 feet. The remainder of the 17th the whole of the 18th and part of the 19th were spent in various short excursions about the top of the hill and to some 800 feet down, examining the vegetation.

Fakirs.

Bába Nának, the founder of the Sikh religion, is stated to have resided for a time on this hill; and on the top of the ridge is a Hindoo temple presided over by a *fakir* of great sanctity, whence the hill is by natives generally called Jogi Tilla. The hill is said to have been anciently called Bál Gundái, and is mentioned as the head quarters of the Goraknáthís, a sect who bury their dead. A great fair is held in spring on the hill. I visited and had some conversation with the present occupant of the fakír's—"*gaddi*" as they style it. He was civil and communicative and like many of his brethern had a grievance which he was anxious that I should ventilate to the District authorities. He has several descendants and followers and they number among their personal adornments the horn like excrescences *(kakkra singi)* of the Pistacia, stuck through holes in the lobes of the ears. These excrescences are in the plains ordinarily sold for medicinal purposes.

This hill has a rather isolated position and from certain directions a peculiarly *prononcé* shape so that it can easily be distinguished from a great distance on various sides.

Prospect from Tilla

From some of the heights in the neighbourhood of the temple and from another old building on a height somewhat to the south-west, a very extensive view is obtained. To the east-ward, one looks out over the longitudinal hollow, and the summit of the great eastern scarp which drops sheer down some 1,200 or 1,500 feet, on across the Jhelum to the low Pubbee Range, and the Goojrat plain, to the Chenab in the distance with the Jummoo hills stretching far away to the left. To the westward a good bird's eye view is obtained of the Doomeli plain, in about half its extent rugged and raviny, the remainder at that time dotted with tanks and pools, and smiling with the spring crops. Beyond it, runs the narrow knifelike Nílí or Bukrāla ridge, rising on the south into Diljabba with Drengan and Karangli and the mass of the eastern Salt Range proper, further to the south. Altogether a wide and fair prospect, and as the amount of vegetation and the height must temper considerably the violence of the hot winds which sweep over the scorched plains below, one can believe that in summer, Tilla is by no means an undesirable place of residence.

I am indebted to Col: Bristowe for the following information regarding the climate &c., of Tilla.

Climate of Tilla.

No systematic and long-continued observations on the temperature have been made, but frequent personal experience and such observations as have been recorded, indicate that up to the commencement of the rains the temperature on the top of Tilla is but little under that of Jhelum. After the rains have begun, however, the balance is very much in favour of the former. Eight observations made on the hill 30th June and 1st July (1866) shew a mean temperature of about 81°, at least 12° under what it was at the foot of the hill, and about the same as at Jhelum within the next 24 hours. Observations were made during the whole of August (1863) when the thermometer *frequently* sunk to 70° in storm of wind and rain, but after several dry days rose to 80°. One hundred and ten observations made (rather irregularly) from 11th August to 10th Sept. (1866) give 83° as the highest temperature noted, and that but once, with 65·5° as the lowest and a mean of about 75·2°. In September there are said to be on Tilla none of the flies and musquitoes which torment one's existence in the plains. Potatoes do not grow to a large size, nor indeed do vegetables generally succeed well. All have been tried and squash and tomato do perhaps the best of any. Porcupines are a terrible nuisance in gardening here, as they grub up or eat all they can get at. Pistacia has at last been raised in considerable numbers from seed after various unsuccessful trials. A large quantity of Pinus longifolia seed was sown in August 1863, many of the young plants died, and in July 1866 the survivors had reached 2 to 3 feet in height.

Trees at top of Tilla.

There is near the *fakir's* a large tank built by Rāni Chand Kour, said to have been a failure, with several older ones, and on the south-west spur some 800 feet below the summit of the hill there is another of considerable size. There being no springs or wells high on the hill, all of these are replenished by the drainage from the heights around and supply abundant water for natives, animals, and washing. Drinking water for Europeans is carried up from Bhet. Near the upper tanks is a small garden belonging to the *fakir* with magnificient old *Jáman* tree (Sizygium Jambolanum) 15 feet in girth, hollow, and long past the fruit bearing age. There are a few trees of Cordia latifolia (*lasora*) and not far off is the *Chil* tree (Pinus longifolia) mentioned by Dr. Aitchison. It was planted about fifty years ago by the great-

(*charanglī*, eaten as a carminative), Amphicome Emodi, Adhatoda, Forskählea tenacissima, Asparagus racemosus (*phūt, kanda*) Eriophorum comosum (*babūr*), and Cheilanthes farinosa. Solanum sanctum (*bara maukrī*) is not uncommon, and S. Xanthocarpum (*chhota maukri*) also occurs, the fruit of both being eaten as pickles or otherwise. Cuscuta reflexa (*Níra tár*) was common in some places on Adhatoda.

Bamboo on Tilla.

The clump of wild Bamboo, in the glen to the south, mentioned by Dr. Aitchison, is by no means so luxuriant as his description would seem to make it, seeing that there are only a few dozen stems, generally not exceeding a finger in thickness. Nor are these by any means the only habitats in this neighbourhood, for there is one clump under the small scarp already referred to, close to the bungalow on the east, and there are a good many patches on various parts of the Rúpwálí Las a less prominent hill than Tilla a mile or two to the south-west of it. It will be seen afterwards that I also found several clumps on Diljabba to the west. These habitats are interesting in connexion with the general distribution of the ordinary wild Bamboo of the outer North-west Himalaya, probably Bambusa stricta? The largest extensive tracts west of the Sutlej, near which below Belaspore it is abundant, are in the Siwáliks on the left bank of the Biás in Hoshyarpore. To the west of these the only tracts of economical value are several small ones near the débouchement of the Chenab in Jammú territory and another near Sháhdara in the Rawulpndi district. Beyond the last to the north-west I know of no wild Bamboo, and in both of these last localities the supply is said to be limited and the stems small. It is curious enough that we should find these few scanty, isolated Salt Range patches, in so unlikely a place so near the western limit of the plant.

Descent to Bhet.

On the afternoon of 19*th* March, I descended to Bhet about four miles to the north-west, by the route of ascent, observing one or two plants of Lilium trigynum (*Kaur*) and Cryptolepis sp: near the foot. At Bhet there is a single planted tree of Prosopis Spicigera (called *seh*, though the usual name is *jhand*) which does not I think occur wild for several miles on either side of this place.

To Futtehpore across Doomeli plain.

On 20*th* March, 16 miles west to Futtehpore, crossing the southern part of the Doomeli plain, lying between the Rhotás and Bukrála ranges, and here averaging 1,100—1,200 feet above the sea. It is in places much furrowed by ravines, the structure being mostly an alluvial, clayey soil, with sandstone occasionally cropping out. There is but little of the picturesque about this plain, and villages are not very frequent. Ploughing was going on in many places, the crop on the ground being chiefly wheat (*bájri*, Penicillaria spicata, being the hot weather crop) with a good deal of cotton, much rape; (Eruca sativa (*jamá*) and some mustard, Brassica campestris (*sarre*). The oil of both of these last is eaten and burned. Part of my route lay by interminable and fatiguing descents and ascents through a labyrinth of deep ravines occasionally traversed by small tributaries of the Boonhár stream the sands of which are said at one time to have been washed for gold. In some of the more humid corners of these ravines, Dalbergia trees were common, ranging up to two feet in girth, but generally with short trunks. Small trees of *kikkar* occurred occasionally near villages, only one of the Cypress-shaped variety being observed. *Phulái* was frequent all over, and in a ravine near the village of Pind was a grove of it about a mile long, the trees mostly of large size, up to 30 feet in height, but many of them dying at the top.

The shrubs &c., were almost invariably much scrubbed down for fuel and fences. Butea occurred in one or two low places. Acacia eburnea was seen, and Gymnosporia and Adhatoda were most abundant of all. Calotropis procera (*ak*) was seen, Peganum Harmala (*harmal*) was common locally, and Nerium odorum *(ganīra)* occurred in the low streambeds, where also Zeuxine was abundant at one place. The other more notable plants were Taverniera nummularifolia, *(Kathi)* a pretty little shrubby plant with pink flowers, Asparagus sp. *(chūrīsaroch,* undescribed which is common in many parts of the Punjab,) Astragalus multiceps *(tinání)* a furze-like spinous species with yellow flowers, greedily eaten by camels, and Salvia Moorcroftiana not yet come into flower. Futtehpore, where I camped for the night, is a small village lying on the high ground close to the deep bed of the Boonhár stream not far below where the latter comes through the Bukrála on Níli range, by the Ghorigalla gap. This happens to be the home of some families of acrobats, hardy stringy fellows, who went through a few simple athletic feats for my delectation.

Futtehpore.

To Ganj Ali Shàh.

On March 21st, some 12 miles to the south-west to Chūa Ganj Ali Sháh, traversing *en route* along the top of Diljabba, which with its more varied flora and scenery and its cooler temperature made the day a more pleasant one than the preceding. The first portion of the way for two or three miles until the foot of Diljabba was reached, lay up the bed of the Boonhár and one of its tributaries, and across some very arid steep sandstone ridges. Here the vegetation was very scanty. In the sandy streambeds three small Umbellifers were common, all called *bal ajwáin* (i. e. wild *ajwáin*, Ptychotis). The seeds of one of these, a Pimpinella, are used as a carminative. A good many of the plants of the preceding day, such as Astragalus multiceps and Taverniera were seen. Alhagi maurorum (*tamiya*) and Malcolmia strigosa (*pathra*) were common, and Cousinia calcitrapœformis (*jangli polí* i. e., wild safflower) was frequent in young leaf.

Ascent of Diljabba.

The ascent of Diljabba over the backs of the sand-stone strata here dipping to the S. E. was tolerably easy, the lower part being rath-

or bare of shrubs. These get more common towards the top, the chief plants noted on the ascent being as follows:—Ballota, Periploca and Hibiscus vitifolius occurred, and Ehretia, Sageretia, and Acacia eburnea were all more or less common to the top, one or two trees of Fluggea virosa occurred, and Marsdenia Royleana (*tar*) was seen half way up in a ravine with a good deal of jungle. The fruit of the latter is used as a cooling medicine. There were a few plants of Cissampelos Pareira, said to be called *patáki* from the noise made when the leaves are cracked on the hollow of the half-closed fist. In the ravine, as well as in two places in another ravine further south, are a few clumps of bamboo, this being the furthest west habitat traced in the Range.

Top of Diljabba

Two of the higher parts of Diljabba, reach about 3,000 feet above the sea but the view is not so striking as that from Tilla. Eastward lies the Doomeli plain closed in by the Rhotās range, while to the north east runs the Bukrála ridge, presenting in parts merely a steep slope and upright scarp on either side, with almost no vegetation. To the west and north lies the arid, bleak looking plain of Doomun and Chakowál, more than half of it much seamed by ravines and only part of the rest cultivated, almost treeless except at villages, and with but little scrub. Although this mountain so nearly reaches the height of Tilla, there is considerable difference in the vegetation. On the flat parts along the summit ridge of Diljabba there is, no doubt, as on Tilla a good deal of Acacia modesta &c., but on the hill generally there is much less jungle here, and many Tilla plants are not found at all. This no doubt partly results from Tilla being somewhat nearer the rainy outer Himalaya, as well as from the hill mass at Diljabba being considerably the smaller of the two. On and near the top of the hill the following were noted Butea, Bauhinia and Odina occurred, and wild Ficus Indica was not uncommon, along the cliffs. Capparis spinosa, Cocculus Leæba, Inula oblonga, Linum trigynum and a pilose form of Solanum nigram (*ukāch-māch*, the fruit eaten) were seen. Taraxacum officinale (*dúdh bhatal*) was common here and at places down to 2,000 feet lower. Salvia Moorcroftiana of which both seeds and roots are used medicinally, and Scrophularia scabiosœfolia were common, both being called *lapkra*.

Descent from Diljabba.

Chúa Ganj Alia Sháh.

After walking for a couple of miles along the ridge of the hill, and passing the highest point (3052 feet) on which are some ruins and marks of what were fields in Sikh times, my route lay downwards, at first on the west and then on the east side of the hill. Along both aspects on the higher part of the hill is much jungle of Olea, and especially Dodonæa. This was by far thicker on the west side, where, as usual in prohibited places, felling was going on. In a ravine at 2,000 feet, Salix Babylonica was observed. My camp was at Chúa Ganj Ali Sháh (1,090 feet), in a rather picturesque little spot lying on the stream running through the glen between the southern end of Diljabba on the north, and Diengan on the south. Close to this on the west is the *Lúnclí pattí* or rogue's strip, so called from its existence being concealed by a Moonshee in order that he might pocket its revenue. It may be noted that Chúa means a fountain or stream.

On the 22nd March, my course was southwesterly 12 miles to Dillúr over the tops of Drongan and Karanglí a stiff day's work. Nerium odorum was common by the stream, and among the plants observed in fields and waste places near the village were Sisymbrium Sophia (*naktrūsi*) Goldbachia lævigata (*bathal*) Hypecoum procumbens (*markan*) Silene conoidea (*surāhi*, from the decanter like shape of the calyx,) Papaver cornigerum (*jangli post*) Lithospermum arvense (*ardusī*) Nonnæa pulla (*kirimár* "insect killer") and Chenopodium murina (*bátú*), the leaves of which last are used as a vegetable. The ascent of the hill Drengan or Chel, by a path well worn by

Ascent of Dregan or Chel.

the feet of pilgrims to the shrine above, commences from close to the village. A short distance up there were a few plants of Edwardsia Hydaspica (*kún*) a plant with fine yellow broom like flowers. It is said to be eaten by goats only, and universally held to be poisonous to other animals. At a tank in a hollow about half way up was a large Ficus venosa, and a very large tree of 10 or 12 feet girth of Pistacia integerrima, of which one or two more specimens were seen. Acacia eburnea, occurred. Dodonœa Gymnosporia *&ca.*, were common, while Olea was the most abundant of all (with fresh felling as usual) and constituted the chief part of the jungle near the craggy top, composed like most of the hill of sandstone. On the very summit of Drengan is a temple, and a *fakīrs'* dwelling, to which resort many pilgrims. The height is 3700 feet and the view very fine, comprising Tilla &c., in the distance and the village and well-cultivated and fertile plain of Bishárat below to the eastward forming part of the Jhangar tract which averages about 2,200 feet above the sea, and is shut in on the east by fairly well-covered low hills, and on the south by the bare sandstone and saliferous hills towards Kúsak. To the South of Drengan the country is very hilly and the view to the west is closed by the adjacent Karangli. Near the top were some plants of Jasminum grandiflorum apparently wild, and Amphiconre, Micromeria biflora, Arabis arenosa, and Physorhynchus occurred.

Top of Drengan.

Over the low ridges and ravines between Drengan and Karangli, Dodonæa and Adhatoda are the most common shrubs, with a good many lopped and cropped Olea in some places. In one place huge dikes of large stones were observed, but the most common fence was a high piled hedge of boughs of the *kikkar* trees which grew by hamlets. Ficus caricoides was seen as much as 5 feet in girth and 20 in height. This bit of country is excessively arid and Karangli itself is still more so, being

Drengan to Karangli.

Karangli

a knife-like, sand-stone ridge with a steep slope towards the east, a perpendicular scarp to the west. The summit is about 3500 feet above the sea, but the prospect from it is much closed in and not nearly so effective as from Drengan. There is no fertile expanse in sight and the low sandstone hills towards the east are very bare of vegetation. I observed none of the old breastworks which on Karangli are said to have formerly given shelter to a beleaguered band of the Janjooa tribe but they are probably on a more northern part of the ridge. How the besieged proposed doing for water is not apparent, for the nearest supply of any moment is in a small stream flowing north to the Boonhár in the valley at the foot of the scarp at least a mile and a half off and 2,500 feet below. Where not too steep even the upper part of Karangli is considering every thing wonderfully wellclothed with jungle which however has no variety, but consists almost entirely of Acacia modesta, a little Olea, and less Dodonæa. Antimony was formerly dug from the face of the precipice and lives occasionally lost in the process. A welllike hole exists on the hill, by which a Pír is said to have made his exit after coming underground from Kashmir.

From Karangli southward.

From Karangli I had still some five or six miles over a rough and mostly uncultivated country nearly due south. Several low limestone ridges and deep ravines with a good deal of jungle were crossed. In a deep valley near the end, Edwardsia was abundant and the pretty pink and white Tulipa stellata (*bhúmphor*), and Colchicum sp (?) in fruit were common. At Dillúr I put up in a bungalow reared in part on what was once the fortlet of Bairookhán a Janjooa chieftain, situated at 2,560 feet, on a meridional ridge of limestone with a steep dip to the east. The view here is very pretty of the valley of Chúa Saidan Sháh to the west with a bungalow and gardens &ca, which were visited in the evening, but will come under notice by and bye. This place is

Willúr ridge.

considerably more pleasant in the hot weather than the scorching plain to the south of the Range and is used as a sanatarium by the European residents of Pind Dádan Khán on the Jhelum (a sub-station of the Jhelum district). On the road down the hill to the village of Saidan Sháh is or was a large stone associated with the saint whence the place takes its name.

Dillúr to Kúsak.

On 23*rd* March, an easy day, by a fair road to Kúsak some six miles nearly due east. After crossing the deep valley on the East of the Dillúr ridge the road ran for part of the way across a prolongation to the south-west of the Bishárat table-land, about 2,200 feet. A good deal of this was uncultivated, and Olea, Gymnosporia, Sageretia Brandrethiana (*Koher*), Dodonœa and Acacia modesta, were abundant and Butea occasional, all being terribly lopped. The leaves of Butea are eaten by buffaloes, the twigs of Sageretia by goats, and bullocks will eat Dodonœa leaves but only when very hard up for food. The bitter leaves of Olea are said to be best relished of all. One Olea tree of 7 feet girth and another as much as 11 feet girth and 40 high were observed. A Ficus Indica of 25 feet girth was seen, and at a *fakir's takia* some two miles south-west of Soloi, where are said to be gardens of old standing, were some plants of Euphorbia Royleana (*tor danda*). This plant, singular enough, appears to be nowhere indigenous in this Range, although the conditions are similar to those of its usual habitats in the outer Himalaya, abreast of this.

Saliferous tract.

The last mile or two lay through the southern belt, where I got my first sight of the staring red saliferous strata. These are excessively bare with hardly a shrub or herb scattered over their furrowed surfaces. The upper part, and especially the northern aspects of the same ridges, however, have frequently a good deal of Olea and Acacia modesta, particularly in the ravines. I encamped on the plain at the foot of the rock on which is built

Kúsak fort, near a few fair mango trees, and some *kikkar* of 3 or 4 feet in girth. The rock is bold and pronounced, and on the irregular top some 200 feet above the plain, and 2,700 above the sea, is a fort where Runjeet Sing is said to have besieged the last of the Janjooa Chieftains for six months. Success was at last attained, on the water in the tank inside running short, and the defender being plied with lavish promises. These last appear to have been favourite weapons of the great Sikh conqueror in difficult cases. For, a few weeks afterwards at Mankhora in the heart of the desolate Sind Ságur Doab between Dera Ishmaïl Khán and Jhung, I was told that the great fort there yielded to Runjeet after a thirteen day's siége on his promising heavy largesse to some of the head men among the defenders. The sequel of the Kúsak story is that on the evening of the very day of surrender, rain fell in torrents but the Janjooa was loyal to his word. The path to the top of Kúsak rock, at the time of my visit the residence of an officer of the Salt Department, is very steep and in part painfully bad, nor is there much in the Fort itself to merit attention. And the view is closed in on almost all sides by the bare, red, uninteresting salt hills.

Kúsak to Pind D K.

On 24th March, some 10 miles nearly due south to Pind Dádan Khán. The first part of the way lay down the ravine of a saline brook, and then for some miles sloped along over the great arid talus which in many places skirts the base of the Range. From the beginning for some distance, Salvadora oleoides is common. It is called *jál*, and the fruit (*pilú*) is said to be ripe about June. Further on, Acacia modesta, Grewia betulœfolia, Periploca aphylla, Physorhynchus, and Farsetia were not uncommon, and Gymnosporia and Acacia eburnea occurred. Rhazya stricta (*wani*) was abundant for some distance. Its bruised leaves are used medicinally, and goats are fed with them after steeping in water for some days. Tecoma was common but much browsed down, animals being said to be very fond of it; its flowering period is a month later than the time of my visit. Capparis spinosa (*taker*) occurred, its fruit is stated to be eaten by Khatrís chiefly and never by Mussalmáns. Still further out, upon the dry stony slope, vegetation was more scanty, and consisted chiefly of Adhatoda with stunted bushes of Capparis aphylla, Rhazya and Grewia betulæfolia.

Near this the aspect of portions of the outer part of the Range, where it is not composed of the red saliferous marl &c., reminded me of some of the Northern Trans-Indus hills, but the vegetation, although similar, is more scanty than in those. At a tank by the way there is an immense Ficus Indica, and at such places Hyperanthera occurred, as well as clumps of Acacia Arabica and Zizyphus. These two were common at villages and in fields, especially the Acacia which frequently reached 5 feet girth; and there were occasional specimens of the cypress-shaped variety. All of these trees were terribly lopped in many places.

Tract near river.

Several Salsolaceous plants were now common, Panderia pilosa, Chenopodium murale, and in a less degree Suæda fruticosa. In the rich alluvial tract along the river, wheat was the most abundant crop and looked well, and there were a good many fields of cotton of the preceding season. Here one of the most abundant weeds was Tribulus terrestris (*bakkra*), the young plants of which are used as *ság* (vegetables) and the seeds are also eaten.

Pind Dádon Khán.

There is not much of interest at Pind Dádan Khán which lies at about 500 feet above the sea. It is a considerable native town, depending chiefly for its importance upon the transit of the salt from the mines in the Range close by, the export of surplus cotton and other produce, and boat-building.

Towards Chúa Saidan Sháh.

On the afternoon of 25th March, on my way to Chúá Saidan Sháh (14 miles north by west) I rode out to Keura some six miles, *Keura Salt mine.*

where I went through the largest of the salt mines. The process of extraction is not a very elaborate one, and the excavations appear to be exceedingly irregular, so much so that to a stranger the place seems labyrinthine. In some of the larger caves the lights of the miners have a spectral weird effect, bringing out the projecting rocks and the gloomy hollows in a striking way. The closeness of the atmosphere, and bad smell, were by no means what one had been led to expect. The salt is said to have been dug in these hills and indeed almost in this very place from the time of Akbar. The quantity annually extracted in the Range is something enormous, and brings into the Government Treasury nearly forty lakhs a year, on the collection of which, there is perhaps less expenditure than on any other large item of Revenue in the w of India.

Ascent from Keura.

The elevation of Keura is about 1,100 feet, and through the gorge here a small stream finds its exit from the hills. In the gorge and for some distance below, Rhazya was abundant. Forskählea was occasional here and on the ascent which commences pretty steeply from Keura. High on the right at 2,100 feet is seen the sanatarium of Tabar, a small village to which the miners with their families retreat in summer when the work is closed. Capparis spinosa was abundant on the cliffs, and there and on the hill above (as well as on other occasions elsewhere) were found the two species of half shrubby Pluchea noted by Dr. Aitchison. I however never saw them "arborescent," and indeed only one of the two seemed to me to reach 2½–3 feet in height. There is, here as elsewhere, but little vegetation until one has crossed the saliferous and allied strata; but on getting to the limestone, there is in places a good deal of scrub of Acacia modesta &c., although the hills here are by no means well covered. Grewia villosa occurred here. Near the highest point of the route at Pid

Pid Coal mine.

(2,700 feet), I visited the incipient coal mine, which did not then look very hopeful. As it was by this time dusk, I hurried on, but only reached Chúa Saidan Sháh after it had been dark for some time.

Chúa Saidan Sháh.

The bungalow at Chúa where I staid over the 26th, is within a mile of Dillár (visited on the 22nd,) but some 700 feet lower, being only 1,870 feet above the sea. It is prettily situated amid a good deal of verdure above the west end of the Dillúr valley, close to where the small stream from Kutás rushes down a gap to the east. The valley, with the ridges and bungalows at its eastern extremity, forms a picturesque foreground, the steep scarp of Karaṅgli showing prominently to the north-east beyond. Vegetation is luxuriant here with a curious mixture of art and nature, garden and jungle. The opium poppy is cultivated, and Rose bushes cover a considerable extent of the shingly slopes, men from Rasúlnaggar coming at the proper season to manufacture *atar* from its leaves. The ordinary vine is common, but I saw it nowhere wild. There are many plum trees (*khúbáni*) and I think apple trees. Mulberry trees of 4-5 feet girth are common. And there are a good many Pistacia, which at that time was adorned with its bunches of red young leaves. Ficus venosa grows in clumps on the rocks by the tiny waterfall and Tecoma and Zizyphus vulgaris are frequent. Edwardsia is common, and Salvia Moorcroftiana, Tulipa stellata (*chabúna,*) and Allium rubellum (*jaṅgli piyáz*) frequent. The appearance of some of the heights to the west, where there is a considerable jungle of Dodonœa and Adhatoda, reminded me of the lime-stone hills near Campbellpore on the Hurroo, although rather less bare than the latter. On the arid and stony plateaux, among these heights, grew myriads of a minute Ophioglossum (probably a form of O. vul-

Gardens &c

Wild plants.

gatum according to Capt. Beddome), rarely as much as two inches in height.

Towards Chak Khúshi

On 27th March, 12 miles west to Chak Khúshi, along the Kahún plain, altogether in the middle belt of the range, in the limestone tract. Hydrilla verticillata and Chara were abundant in a stream by which grew Typha angustifolia (*kúndar*) the leaves of which are used in roofing. Ballota was common. Edwardsia and Astragalus multiceps were abundant most of the way, resembling somewhat in appearance the broom and "whin" of Scotland.

Kutás

About a mile west from Chúá and ascending about 300 feet is the village of Kutás (2,160 feet) with a good deal of moisture and vegetation. Tolerably large Salix Babylonica, Celtis, Zizyphus Jujuba and Morus were among the trees. There were also one or two Dalbergia, the largest I saw being only about 6 feet in girth, which is possibly the one alluded to by Dr. Aitchison as the largest he had ever seen. (We can beat that even at Lahore, e. g. a splendid tree at the edge of the Agra Bank compound). Almost all of these trees were very severely lopped.

Temple of mela &c.

Kutás is a place of Hindoo pilgrimage of great antiquity, and said to be mentioned in the Mahabharat and its name *kutáksha* is stated to be derived from the round shape of its tank. The latter is of high sanctity, fed by a spring and believed by the pilgrims to be unfathomed. Indeed a fakir is related to have spent two years in making a rope with which he failed to fathom it. But Dr. Fleming mentions that after having 300 yards of rope made *he* got bottom all over it at 23 feet! In the water which flows from it, are numbers of small fish which are fed by the numerous pilgrims. Around the tank are many houses belonging to Hindoo chiefs and priests, and at a little distance is an ancient temple said to be built of *kamyát* which is a tufaceous limestone. This building is as usual attributed to the Pandoos. Here is annually held a great hindoo *mela*, which with the Mussalmán festival at Sáidan Sháh's tomb the succeeding day is said at times to attract as many as fifty or sixty thousand, or in cheap years up to a hundred thousand pilgrims. The Hindoo *mela* appeared to be in full swing at the time of my visit, but the concourse might almost have been numbered by hundreds. And of all the filthy native villages it has been my lot to pass through, the lanes of Kutás were on that day the foulest. The people however were tom-toming and piping, and jingling about with bracelets, anclets, and necklaces, having their gayest parti-coloured clothes on, regardless of sanitary or other such-like matters. I was glad enough to pass quickly through.

Along Kahún plain.

The central portion of the Kahún plain, along which the road runs, averages about 2,100-2,200 feet above the sea. The heights in the southern belt of the Range do not here rise much above that, but along the northern margin runs a series of pronounced and very bare sandstone ridges, Dhár or Soorlee (?), the highest peak of which reaches 3,200 feet above the sea. Great part of the plain which is several miles wide, is cultivated, mostly with wheat, barley being very rare. Many of the fields are so exceedingly stony that one would think them not tempting to the agriculturist, but even these are very fertile. Mr. Brandreth mentions that the stones are held to be an advantage by covering and retaining the moisture in the ground, but it seems doubtful if much benefit can result in this way. Towards the west, the plain was in places cultivated up to the scarp of the northern ridge, but on the east there was generally a bare stony tract between. Here again I was struck with some resemblance to a Trans-Indus valley that above Hungoo to the west of Kohát.

Along this plain, trees were rare, one or two planted Melia

Trees and other plants

azidirach (*drek*) and a few Dalbergia, occurred, and Zizyphus Jujuba was still more common. An occasional Acacia modesta in uncultivated ground between the fields was almost the only wild shrub of any size. Among herbaceous plants the following were noted: Lepidium Draba (*chiti phúl wála*) abundant at one place only, a Crucifer very like Goldbachia lævigata (*sem*), common, Peganum abundant, Centaurea Calcitrapa (*kandiára*) common, Carthamus oxyacantha (*poli*, the same name as the cultivated Carthamus) the seeds of which are parched and eaten with wheat &c., Eremostachys Vicaryi (*karáthri*, *garganna*), common, Stachys parviflora (*kirímár*), frequent, used medicinally, and Tulipa stellata (*pádúna*). Withania somnifera (*aksan*) occurred in waste places, and its root is said to be used "medicinally." It may be noted that cases have occurred in the Punjab of the application of its root for the purpose of criminal abortion, although I think the books do not allude to this possibility.

Chak Khúshi

There is no considerable village at Chak Khúshí, so my camp was pitched beside a *fakír's* grave close to a streamlet coming from the hills immediately to the south. Along and about the stream and a larger one, (running westward to Kallar Kahár) which it joined, was a good deal of vegetation in places, with considerable plots of Acacia modesta &c. In the brook Herpestis Monnieria and Equisetum debile were abundant. Here, there were some of the largest mulberry trees I ever saw out of the Himalaya, one being 12 and another as much as 16 feet in girth. They were evidently very old, and were said to have long ceased to bear fruit. There was a Salix Babylonica of 4½ feet girth, Zizyphus Jujuba of 10 or 11, and several Acacia modesta of 6 feet and 8 feet girth, and as much as 45 in height. On the dry rocky heights to the south there is but little jungle or other vegetation, the only novelty being an Erodium near E. maritimum, which I had formerly found on the Frontier.

Towards Noorpore.

Northern ridge.

On 28th March, by a very round-about road, 15 or 16 miles to Noorpore, which lies south-west of my starting point. The people had assured me, as is not uncommon in this country, that my baggage would find no straight road to Noorpore, but it turned out afterwards that the camels had no difficulty even in the first rough rocky bit. I first made a long detour straight north to have a look at the northern ridge about two miles from camp. It is composed mostly of grey sandstone with some conglomerate, the strata dipping pretty steeply towards the north with almost no soil and but little vegetation even on the northern slope. And the few shrubs that existed were terribly browsed down. These were principally Gymnosporia, and Acacia modesta, with Olea and Grewia bitulafolia more rare, and Dodonœa or Adhatoda common in some places. Sageretia was abundant and Rhamnus Persica not uncommon; the fruit of the latter also is eaten. Astragalus multiceps was common, as well as Allium indillum, the root of which is eaten raw.

Bleak Country.

Towards the North the view from the crest of the ridge was very bleak consisting of similar bare heights, sandy hollows and rough ground with no water or cultivation. On and near the scarped southern face of the ridge, Capparis spinosa, Cocculus Leœba (*vehri,*) and Ehretia aspera (*baldi Kander*) were common, and Physorhynchus also occurred here. The way to Kallar Kuhâr lay over saline flats with Tamarisk &c., and among low hills mostly of friable red clayey soil with sandstone strata running through it. Capparis aphylla was here almost the only common shrub.

Kallar Kahâr.

The first part of the Kallar Kahâr salt lake (1,800 feet ?) seen from this side is hideous. A stagnant looking shallow pool, with neither animal nor vegetable life and a flat black oozy, saline, sludgy

Tradition as to origin.

shore with a nasty smell. The view of the other (southern and south-western) shore however with its verdant vegetation and crowds of water fowl and the village fields, gardens and orchards backed up to the south by fairly wooded hills, more than makes amends for the bad beginning. The lake may be about a mile in length from east to west by about half that breadth, and is shallow all over. After much rain it discharges part of its water to the north-west. I am indebted to my friend Mr. F. E. Moore for the local traditition that this lake was originally fresh. But a holy *fakír* came to its bank one day and asked for the use of a maiden's pitcher. This the saucy damsel refused on which the *fakír* cursed the lake, and its waters immediately became salt as they now are. The villagers turned out against the holy man who bolted up a neighbouring hill. On coming to an obstructive rock he went right through to the other side of the hill, and the tunnelled way by which he passed, some 150 feet long by 30 broad, is still shown! The water difficulty was at last compromised by the *fakír* creating close by springs for the use of the peoples. There is said to be a tepid spring close by.

Báber Badsháh.

His garden.

The great stone which is said to have been cut out as a seat for Baber still exists, and Mr. Brandreth quotes from that royal author the circumstantial account given by the latter of his progress to "Kuldah Kahar in the middle of the hill of Jodh," what he thought of it, and what he did there during his stay of six months. How its being a very beautiful place with an extremely agreeable climate and suggesting itself as suitable for the formation of a garden, he directed the "Bághi Safá" to be made as a memorial of his visit. Of this effort of the gardening art there are still some very slender remains, the chief beauty of the place now depending on nature not on man, who has in modern times obtruded his handiwork in the shape of a small ugly bungalow. The most of the large trees are Zizyphus Jujuba, with one or two Acacia speciosa, some Z. vulgaris (*amlái*) with red sour fruit, and a good many Pistacia in the full flush of their red leaves were seen in the wood behind. In a corner of one of the fields which now occupy the former royal garden, there was some cultivated Mentha possibly introduced by Europeans. A Narcissus or two "planted in the King's time" with some plants of Aloe perfoliata (*Kodárgandal*) and Euphorbia Royleana (*tordanda*), the juice of each of these two being reckoned medicinal.

Samarkand ridge.

To the south the path led upwards over the eastern prolongation of Samarkand hill, through the wood, in which Acacia modesta is the commonest large tree. There are also a good many Pistacia some as much as six feet in girth. On the low soilless conglomerate heights to the south of the gap in the ridge which is perhaps 600 or 700 feet above the level of the lake, there is the usual variety of jungle, almost the whole of it except Adhatoda being very much lopped and browsed down. Here for some way the Punjab Asparagus sp: (*Kúchan*) was common. I am inclined to think that part at least of the medicinal *Sitāwar* of the Punjab Materia Medica is furnished by the root of this plant. Its leaves and twiglets are certainly sold by *pansáris* under the name of *sitáwar patte.*

Vunhár tract.

The path lay across the Vunhār tract which comprizes the country to the south-west of Kallar Kahar. For some miles here it is pretty elevated and very rocky, raviny and arid, with but few patches of cultivation, and a good deal of scrub, consisting, chiefly, of Acacia modesta (and occasional plots of fair sized trees of this) with some Olea &c. By and bye there was a good deal of cultivation. The chief plants noted were Edwardsia, Carthamus oxyacantha, Francœuria crispa (*phatmer*, used medicinally) Taraxacum (*batthal*), Stachys, Salvia Moorcroftiana, Eremostachys, Allium rubellum, Tulipa, Colchicum, and

Noorpore

Gagea lutea. In some places there were perfect meads of Malcolmia strigosa (*saunchar*) producing quite a heath-like effect with its lilac flowers. Noorpore is a small place (at 2,300 feet) situated among rather tame scenery in undulating ground close to the southern edge of the middle belt near where the Nílawán brook leaves the Range. In the fields here there was abundance of a species of Iris in fruit which I had previously found Trans Indus. And the small Ophioglossum was common in places, but of rather larger size than at Chúa.

Towards Pail

Nílawán gorge.

On 29th March a laborious ten miles, mostly through a glaring, hot, dry country by a round-about road to Pail S. S. W. from Noorpore. From the latter my course for some 2 miles at first was southerly along the Nílawán brook, to near its point of issue from the southern belt into the plains. The strata here were mostly the saliferous marl and allied formations, and the vegetation was not abundant. Pistacia, Ficus venosa, and Grewia villosa (*julidar*) and G. Rothii (*gargas*) occurred. One or two plants of Vitis were seen, (but probably not really wild), and a short way down, Salvadora becomes common. Tamarix Indica, Arundo Karka (*nar*) and Nerium (*Kanira*) are common by the stream, and small wild trees of Dalbergia frequent, Capparis spinosa and Cocculus Leæba were common on the cliffs, and Dæmia extensa (*trotu*) occurred. The lowest part reached was probably not more than 1,000 feet above the sea, and the following plants were noted. Physorhynchus, and a lilac flowered Brassica (*baráni múli*, afterwards frequently got), Taverniera, Pluchea, Pieridium Tingitanum, (*batthal*), Solanum sanctum, S. xanthocarpum and S. gracilipes (*kauri búti*), a very spinous Acanthaceous plant, Rumex vesicarius (*Khattitan*), Ephedra alata (*Kúchan*,) and Asparagus.

Before getting quite to the edge of the Range, I turned up a branch of the stream, and thence my course was nearly

Cross plateau.

west. In many parts of the lower portion of the gorge, in ravines &c., higher up, and occasionally even on the steeper cliffs, there is a good deal of fair sized Acacia modesta, attributable I believe to the existence here of Salt Revenue stations, and the frequent passage of patrols, which prevents the same damage to the jungle as elsewhere. After a stiff climb out of the lateral deep ravine, a high plateau furrowed by ravines was reached, over which my course lay for three or four miles. The whole of these undulating table-lands are very arid and stony with only small cultivated plots, having more pebbles than soil, in the bottoms of the ravines. Even of these some had not been sown that season owing to the want of rain at the usual time of ploughing. Wild vegetation was very scanty, only an Acacia modesta here and there, and an occasional A. eburnea; Colchicum and Tulipa were frequent.

Nameless hill.

Box-tree

On leaving this table-land I crossed the summit of an anonymous hill (3,100 feet) to get into the deep ravine lying between it and Chiniot (3,400 feet), both hills being mostly of limestone. The former is narrow, knife-edged and bare, but low on its western slope there is a good deal of Buxus sempervirens, box, called *pappar* and *pápri*, and its wood *chikri* by carpenters of the plains who manufacture combs of it. It was in full flower with a strong scent. I could not learn that it grows to the east of this line. On and near Chiniot I saw more of this plant than anywhere else. The people make no special use of its wood but the young shoots and boughs are heavily lopped for thatching (*i. e.* to put under the earthen roofs) for which purpose however they say it is not preferred to Dodonœa, but either is taken as may be most convenient. This lopping and felling may perhaps account for the fact that although I saw many scores of acres of it, most of the stems were quite small, rarely over 6 or 8 inches girth, the thickest trunk observed being 16 inches girth. The people state that even the omnivorous goats browse but little of it, and that some years since a herd of camels from a distance ate it greedily, and 8 or 10 of them died from its effects.

Chiniot.

Descent of Chiniot.

The ascent on the East side of Chiniot is very steep and rather rough, and over most of the hill there is a good deal of jungle of Adhatoda, Acacia modesta, Dodonœa, Olea, Gymnosporia, Grewia oppositifolia and Sageretia. The top of the hill (close to which felling was as usual going on) is of limestone conglomerate and has from the east side a curious muriform, castellated appearance. Near this were a few trees of Ficus venosa, and Celtis Caucasica, with some Edwardsia, and there was quite a thicket of Leptopus cordifolia in one place. The descent on the stony western slope of the hill was easy, through scanty brushwood of Olea, Dodonœa &c., Over a considerable area near the foot was much Buxus running up some distance in the ravines. One is tempted to think it would surely be cheaper to protect these tracts of box to help to supply the Indian demand for this valuable and in some respects unique wood, than to import it from Europe.

Pail

Towards Sodhi

The village of Pail near which I encamped is close to the foot of the hill. Here there is a magnificent Olea 8 feet in girth and about 50 high, and I saw a cultivated vine or two. On March 30*th* I went on to Sodhi, about 12 miles W. S. W. from Pail. But *en route* I made a considerable *detour* to the south in order to see part of the Nursing gorge. Although the nights were still comfortably cold, the sun was powerful enough in the day time to render rambling in this dry and mostly unshaded tract very fatiguing, and I found this a hard day's work. For a good many miles in this part of the Range, the central belt is narrow and much cut up by hills and ridges, isolated or running in from

Cross raving tract

Chamærops

either side, and there is not a large proportion of the area cultivated here-about. My route at first lay over stony wastes latterly a good deal cut up by shallow ravines. The vegetation, both shrubly and herbaceous, was in most places scanty. The chief shrubs noted were Gymnosporia, Sageretia and Rhamnus Persica. Marsdenia Roylеana (*reri*) was seen, and Eremostachys, Papaver lœvigatum, Colchicum and Scabiosa olivieri were more or less common, at one place there was a good deal of Chamœrops Ritchiana which I had not seen to the East of this. This plant, which is used for cordage &c, is in the Range variously called *Kílú*, *kalúm*, or *patha*. The last name is by no means as Dr. Aitchison supposes the word *patta*, a leaf, used for the Chœmœrops by a figure of speech, but is in many places the name of the plant itself. The latter I have never found in the Himalaya, but I recently got indubitable proof that it grows in at least one place, (near *Drál*) in the outer range above Bhimbur. In many ravines further west Buxus was abundant, and many wild young Ficus Indica were seen. Grewia villosa (*kaskúsri*) Capparis spinosa (*bauri*), and Solanum sanctum (*mahori*) were not uncommon, Adiantum caudatum was common in rocky clefts, and Rumex vesicarius abundant on arid stony plateaux.

Nursing gorge

Nursing phoár

I now descended into the great gorge with very precipitous sides in which flows the stream called the Nursing wán. Just below this in the gorge is a *fakír's*, close to a picturesque water-fall *Nursing phoár*, (*phoár* I believe means water-fall or fountain) whence this part takes its name. Here I left the path however, and descending to the bed of the stream (about 1,000 feet above the sea) ascended its course for some miles, as it comes round the N. E. edge of Khor (3,400 feet). The gorge is often narrow, is in many

Gorge.

places two or three hundred feet deep, and the walls are occasionally quite perpendicular. But only near the *fakír's* is there much of the picturesque. And as there is no thoroughfare this way, the pleasure of my ramble was much diminished by the difficulty of getting along among rocks, brushwood and tall grass. Along the bottom of the gorge Tamarix Indica was abundant, Salix Babylonica *(katíra)* frequent, and Salvadora occurred. There were a good many trees of Phœnix near the waterfall, but the fruit is said not to ripen well. A few of these also occurred higher up at moist, marshy spots, where there was tolerably luxuriant vegetation with abundance of Pteris longifolia, and Adiantum Capillus Veneris. Trees of Pistacia were not uncommon, generally some way above the bottom of the gorge, and Celtis, Ficus venosa, Fluggea and Zizyphus vulgaris occurred. Vitex negundo *(marwan)* was frequent and Sponia Wightii and Nussiessya hypoleuca were observed. At one place there was a great deal of Ricinus communis (*harnauli*) apparently quite wild, for there were no houses or cultivation at all near this. My guide informed me that cattle die from eating its leaves. Oxystelma esculenta was seen, the seeds of which are said to be eaten (?) and among the small herbaceous plants noted were Scrophularia scabiosæfolia, Gnaphalium lutio-album, Mimulus gracilis and Ajuga decumbens, *(wádi buti)* the seeds of which are used for killing lice.

Along central belt

The gorge now gradually became more shallow, and climbing up its eastern cliff and crossing some rough ground I soon gained the main road traversing the Range longitudinally. The Kher hill to the south-west had a good deal of the ordinary jungle, Dodonæa being most common with masses of Buxus in some of the ravines. For most of the rest of the way there was very little cultivation and the low ridges were scantily covered with Acacia modesta. Adhatoda and Salvadora occurred and there were one or two Pistacia trees. Stunted Olea was abundant locally, and there were occasional clumps of fair-sized trees, one as much as 12 feet girth, with a columnar Fig-tree like trunk. Sodhi is a sort of rest-place between Shahpore and Sakesar, and there being plenty of water, there are a good many trees and a garden is kept up by the District officer in which European fruit-trees are being tried.

Sodhi.

Towards Jalár Kahár.

Under Chumakki ridge

On 31st March a pleasant day's work crossing two considerable hills and several smaller ridges to Jalár Kahár 15 miles south-west. About Sodhí the central belt again widens out into the part called Khabakki and Son Sakesar, the village and small salt lake of the former name being some three miles north-west from my starting point. My route first led me along the northern edge of a range called Chumakki, which I by and bye began to ascend in order to reach its highest point Patiála (Chahar of the map). Before commencing the ascent there were the usual shrubs, Olea, Dodonæa, Acacia modesta, Gymnosporia &c., and occasionally Edwardsia. Astragalus multiceps (*tinni*) was common, and I found that the people frequently eat the young flowers, the succulent calyces of which have a pleasant sweetish taste. Ballota limbata was frequent, the bruised leaves of which are used for ophthalmia in cattle. Saccharum Munja (?) (*sarút*) grew in occasional clumps in sandy places, and the following were more or less common. Peganum, the Punjab Asparagus (*kuchan*), young shoots used as *sag*, and Lallemantia Royleana (*takht malangia*) whose seeds are the *tukhm balangu* of the native Materia Medica.

Patiála.

Buxus was common in all ravines here and on the ascent, where also Dodonæa and Olea constituted the chief part of the jungle. The lower part of the hills of this part resemble somewhat some of those of central Wazíristán, but have a larger quantity of shrubby vegetation although here streams are much more rare in the ravines and glens. Higher up Chamærops was not uncommon and Acacia eburnea occurred. From the top of Patiála (4,094 feet) there is a tolerably extensive prospect, including to the west the fertile Son Sakesar, and nearly due North the small Khabakki lake and much cultivation were visible over a low ridge (Thoha) beyond a good deal of mostly rough or uncultivated ground. Dr. Fleming describes this lake as only existing after rain, but I understand it never completely dries up There may however be some change in this respect even since the time of his visit (1851), for Captain Davies, Deputy Commissioner of Shahpore assures me that this as well as the Sakesar lake is steadily increasing. The top of the hill is composed of a calcareous brecciar, with a dip towards the north. Shrubby vegetation is more abundant on the north-west than on the opposite aspect of the ridge. Chamærops, Rhamnus, Zizyphus vulgaris, Edwardsia and Plectranthus were not uncommon about the top of the hill where also the following occurred. Myrsine Africana *(papri,* thus not particularly distinguished from box which indicates that heer the latter is not specially valued). Asparagus racemosus, *(jári kandiáli),* Physorhynchus, Inula oblonga, Phagnalon denticulatum, Nepeta sp: Portulaca quadrifida and Erodium cicutarium.

Chamakki ridge

For some distance to the South-west the ridge continue ast about 3,000 feet, rising at a mile and a half from Patiála into another hill (Chamakki 2,283 feet) over which my route lay. Along the ridge Convolvulus saxatilis occurred, and Eremostachys and Salvia Moorcroftiana were common. The succulent peeled stems of the last are eaten by the people, and I found them to have a not unpleasant mawkish sweet flavour. After a considerable descent into a deep valley with a stream, there were a good many ascents and descents over various ridges, with much winding and but little of interest in the vegetation. At last the path dropped down a range of steep high cliffs and camp by Jalár (not Jallar) Kahár was soon reached at about 2,000 feet. It is situated in perhaps the broadest part of the whole Range, here some 18 miles wide.

Jalár kahar

In the valley near it Salvadora occurred, Capparis aphylla was frequent and Panderia pilosa abundant. The lake appears to have no affluent or outlet and may be three quarters of a mile long by half a mile broad. It is rather prettily situated with a village and cultivation to the south, and fairly well covered low hills on the other sides except towards the east where the high cliffs mentioned above are prominent. Some of the plants indicate salt in the soil and there is a saline incrustation at places, but ordinarily the water of the lake is fresh and sweet enough for all purposes. After long drought the people say the water of the lake gets brackish (*khapra*) but is even then quite good when taken from the pits dug close to its margin. In the shallower parts Typha angustifolia (*kūndar*) a tall Cyperus and Eleochaus palustris were abundant, and about the margin Ranunculus sceleratus (*chambal*) Rumex acutus Veronica anagallis and Potentilla supina were common.

Lake

Towards Sakesar

Samundra hills

On 1st April, about 12 miles in all to Uchháli, and thence up to the top of Sakesar west north west of Jalár Kahár. The first few miles lay through and over low rocky ridges separated by shallow ravines, occasionally with small streams. The chief part of the shrubby vegetation, at first scanty but latterly more abundant, consisted of Acacia modesta and Olea. With these in many places was mixed a large proportion of Reptonia buxifolia (*garar*) the furthest East I have ever seen it. It is sub-arboreous, with an eatable but not very sapid fruit, and in leaf and general appearance has a strong resemblance to the Olea but it has strong spines, and its branches have much wider angles. Its

Reptonia

leaves are said to be eaten by goats only. Latterly both Olea and Reptonia were abundant in the narrow ravines. Buxus was in many places common though small, Chamœrops was frequent and the following were more or less common. Ficus caricoides (*khabáre*) Grewia villosa (*thamther*) Zizyphus vulgaris (*amrā*), Z. nummularia (*birota*), Acacia eburnea (*babúr*, [illegible]) Edwardsia (*kahen*) Sageretia, Gardenia tetrasperma, Cocculus Leæba (*vert*) the Punjab Asparagus (*banatha*) Eremostachys, Verbascum, Cousinia Calcitrapœformis and the lilac Brassica. One or two Salvadora occurred and Rumex vesicarius grew in places. On issuing from these, t[illegible]amūndra hills, into the Son Sakesar valley I came on t[illegible]ain road which runs along the southern edge of the latter for a mile to the village called Uchâli. In some very stony places where Scorzonera was abundant, and Buxus is common on the skirts of the ridges to the south.

Uchâli.

Lake.

Son Sakesar.

Uchâli is situated at 2,400 feet above the sea close to the most southern point of the great Salt lake called I beleive Samúndar by the Hindoos (who are said occasionally to consign to it the *phùl*, ashes, of their deceased relativ[illegible] and Kahár by the Mussalmáns. This though shallow is a considerable sheet of water, being two or three miles long from north-east to south-west and about half as much in breadth. It has no outlet and receives the drainage of a considerable area, and its level is stated to be steadily rising. As a curious contrast to this last fact I may mention that it is known from old wells &c., in the *bár* to the south of the Range that the level of the water there has got much lower than it once was. To the eastward of the lake lies the Son Sakesar tract the most fertile in the whole Range with ridges to the north reaching 2,800 to 3,200 feet. Son Sakesar, as previously mentioned, grows remarkably good wheat and supports a large population. I find from Capt. Davies that 46,000. acres, one

Capt Davies.

third of its area, is cultivated, and that the population is 21,000, or about 340 to each square mile of the cultivated area. It may be interesting to compare these results for an exceptionally fertile but perfectly rural and pastoral small tract, with the latest figures for the whole of Great Britain, viz: 23 millions of inhabitants (by the census of 1861) and 28 millions of acres cultivated (in 1866), *i. e.* 534 inhabitants to a square mile of cultivated area. Much of the fertility of the soil here, depends (as formerly mentioned) on the drainage from the limestone hills and in this respect the southern part is worst off. In Son Sakesar the culturable is to the cultivated land only as 1 to 6, and ⅔ of the whole cultivation is *rabi*. This contrasts strongly with the state of matters in the tract to the south between the foot of the Range and the desert *bár*. There the culturable is to the cultivated area as 2 to 1, and ⅓ at most of the whole cultivation is *rabi*. The climate of Son Sakesar in the hot weather has been stated, by natives, to resemble that of Kashmir for coolness and salubrity but from the elevation and other conditions, it is evident that this must be a patriotic exaggeration.

Marrubium.

Habits &c.,

In the extensive grave-yard of Uchálí there are a good many fair sized Acacia modesta. Erodium maritimum was abundant, and I saw a few clumps of Marrubium vulgare. I have now noted this plant in four or five different places at hundreds of miles apart (*e. g.* here, near Kohát, in Kashmir, and at Kishtwár), always growing in small quantity in similar places near habitations, and yet never cultivated, so far as I could learn. About Uchálí the long curly locks of the men *à la Beloch* seemed more notable than usual. I observed my guide muttering a prayer for blessing as he passed a *fakir's* tomb marked as usual by rags fluttering from a tree, and the same man subsequently asked me if it were true that our "prophet" was the Son of God as the *Pír Padri* was reported to have told the people at Shahpore. This shews that even in out of the way places, the people pay more attention to our creed than we are apt to suppose.

Ascent of Sakesar.

Leaving the village I set my face towards Sakesar now showing prominently three or four miles to the west. For a mile the road is nearly level and passes along the south-western end of the lake, where Tamarix Indica occurs and T. dioica (?) is common; Vitex was seen, and here and there were a few trees of Tecoma undulata (*rahúra,*) one of them about 4 feet girth, the wood said to be in repute. I took the "short cut" nearly straight towards the top of the hill for about 1,000 feet of rise where the regular road was met. One or two Reptonia occur here, and Pistacia is not uncommon. In ravines there is a good deal of Olèa, but on the more exposed parts the jungle consists chiefly of Adhatoda and Acacia modesta (with marks of wholesale fresh felling as usual). From the point where the road was joined, about 3,500 feet, to near the top of the hill 5,080 feet above the sea, the following were noted. At first, Odina wodier (*díla,*) Grewia elastica? (*phalwa*) Celtis (*wattamman*) Grislea, Bauhinia variegata, Ficus venosa (*war*), Ephedra, Barleria cristata, and Asparagus racemosus (*vinjanhora*). Further up, and for the most part met with to the top of the hill, were Myrsine Africana (*vávarang;* this in the Himalaya often furnishes the *bebarang* of the native druggists), Rhus Cotinus (*lárgá*) Acacia eburnea, Indigofera arborea (*keinthi*) Clematis grata, Periploca, Physorhynchus, Artemisia Indica (?) Inula oblonga, Trichodesma, Onosma echioides, and Origanum.

Sakesar.

In preference to putting up in any of several tumble-down buildings I pitched my tent near where a good bungalow was being erected for the Shahpore district, on perhaps the finest site of all, near the summit of the hill with a wide prospect towards the north and west. This however is not the best view from the hill as

Prospect.

the Tullagung and Miál tracts to the north and north-west and the Range itself to the westward are bare and unpicturesque. But from the opposite side towards the east the view is very pleasing, with the Samúndar far below in the fore-ground and the small Khabakki lake some miles beyond, their banks and the tract around dotted with hamlets and clumps of trees, the whole enclosed by the ridges towards the north and south sides of the Range which further east seem almost to meet in a net-work of hills between Sodhi and Jaba. The more distant view in a clear day includes the Sufed koh, Shaikh Boodeen and the two great hills of Wazíristan (Pír Ghal and Shwayghar) and the Takhti Súlíman, all Trans Indus, with some of the higher Himalayan peaks far to the north-east. On the whole the time of my visit was unpropitious for forming a favourable opinion of the beauties of the hill itself. For all about the higher parts, almost every branch had been sacrificed in order to burn lime for the house which was in progress, while many parts in various directions were blackened by a "forest fire" that had taken place some days before. The apparent desolation thus caused prevented my appreciating Sakesar as I had done Tilla, although from the elevation of the former its conditions should perhaps be better.

Denudation.

Sakesar as a station.

At various times since annexation there have been schemes propounded for more fully utilizing whatever capabilities Sakesar possesses, by installing it as the head quarters of a district to be formed out of certain exceedingly awkward corners of existent districts. And for the furtherance of this plan reports and memos: have at times been written of so very roseate a hue, that one might imagine the locality to combine the qualities of Elysium and Eldorado, a magnificent climate, a fine view, easy access, abundance of wood, grass and water, and English vegetables, with the prospect of tea plantations, lots of visitors, mailcarts to the foot of the hill, and steamers on the Jhelum. All this constituted a not unpleasant picture and there was a good deal of hopeful correspondence regarding the proposed district and its head-quarters. But these hopes appear to have been blasted in a night like the prophet's gourd, by the sirocco of a memo: from the trenchant pen of a well-known ex-Punjabee, which wound up with, "this worshipping of high places and hill-tops will bring down a curse upon us"!

Sakesar is traditionally stated to have supplied a place of refuge for the Pandāvas in times of trouble. And round a large rock close to the summit, which has a legendary connection with them, a great fair is (or was) annually held in Spring. On the extreme summit at the northern end of the ridge is the *Singhásan* "throne," now the ruins of a small house built by a *fakir*.

Meteorology.

Captain Parsons.

Captain Smyly.

I have been able to gather only the following few items as to the meteorology of the top of Sakesar, on which snow is stated to fall not unfrequently in winter. In the summer of 1860 Captain Parsons found that there was a rainfall of 11 inches within a month, and in 1861 Captain Smyly made a series of Thermometrical observations of which the following is an abstract :—

Month and date.	Average temperature.				In Shade.		In Sun.	
	In Shade.			In Sun's rays at noon.				
	Sun rise.	Noon.	Sun set.		Highest.	Lowest.	Highest.	Lowest.
May, ...	75	84	80	98	94	62	118	74
June, ...	76	82	80	96	90	64	109	82
July, ...	72	76	76	84	84	63	100	72
August, 1–18th, ...	71	71	76	84	80	69	90	70

Dr. Cookson.

During these 3½ Months there would appear to have been only a few inches of rainfall. In 1866 Dr. Cookson, Civil Surgeon of Shahpore, made careful and regular barometrical and thermometrical observations from 19th June to 15th October of which the following is an abstract :

Month and date.	Barometer Average.	Rain inches.	Temp at 10 A M Average	Temp: at 4 P. M Average	Max. temp in Sun's rays		Extremes of Temp by self registering thermometers			Dew Point.	Humidity 1=saturation.
					Highest observation	Average of Max & min:	Highest observation.	Lowest observation.	Average of Max & min		
June 19-30th.	24 67	3	78 8	90·3	145	138	106	67	87·8	62 3	422
July.	24 72	3 8	80·5	80 8	137	128	100	55	78 1	64 2	886
August,	24 75	2·	76 5	77·4	132	123·7	88	62	74 5	67·7	751
September,	24 84	3 3	73 8	76·2	132	121	87	42	72·	53·9	450
Octr. 1-15th,	24 93	5	73 2	71·	135	118	72·1	51	73·3	48 6	·419
Total.	·	9 9	78 7	79·		125 7			75 1		546

Means.

Dr. Cookson remarks that the approximate average temperature for the four months (including part of the hottest period of the year) is only 75° or 1° under average summer heat in England. And that in the Sun the thermometer rarely rose above 135°, and only once reached 145° at a time when in the plains it would attain 175–180° or more. This last result he attributed in part to the fact that the summit of the hill being isolated there is thus much less refraction from heated surfaces. He conceives that the aridity of the Range generally has probably been unconsciously exaggerated by most visitors from the geological conditions being so unfavourable to vegetation and verdure. I would not be inclined to attach very much weight to this view of things, for although there is doubtless truth in it, the figures indicate that the place is arid enough for most tastes. Captain Davies states that not only were the rains less copious in 1866, but that the rainfall on Sakesar is always much less than on the spurs and in the tracts close round its base.

Vegetation &c high on Sakesar

As I had to wait a day or two on the hill in order to meet Captain Davies, I had an opportunity of examining in some detail the vegetation on the upper part of it, down to the level of about 3,500 feet in various directions. (As well as of testing how far a very Carlylian volume of Carlyle can act as antidote to some of the views of Buckle!) Most of the upper part of the hill is composed of nummulitic limestone, with a considerable dip to the N. N. W and scarped in the opposite direction, overlooking the tangle of low hills of the southern belt of the Range about the village of Amb, some 3,000 feet below the crest.

Water supply

Wild sheep

Various small springs not far from the top of the hill supply a sufficient quantity of water for a limited population. And a few hundred feet down at a *fakír's* is a well, the supply in which was much lessened some years ago by a mistaken attempt to improve by deepening it. Close by the *fakir's* in a hollow to which tends a good deal of drainage was a Tantalus tank which *did* not *hold* water. The nearest considerable perennial supplies of water are at about a mile and a half from the top of the hill in two different directions. For miles over the hill there are no habitations and but few visitors except shepherds. Many parts are very wild and solitary, and quite on the crest among broken rocky ground I came on a group of *húriál* as the wild sheep is here called. In several parts of the Range this animal was at one time abundant and is still not uncommon.

Dalbergia at 5,000

Of all the plants met with on Sakesar I was most surprized to find Dalbergia numerous in many hollows quite close to the top of the hill. There were thousands of trees apparently wild, but all quite young and not over 8-10 feet high. I do not recollect ever having seen the tree at so great an elevation, and it is to me quite a mystery how it could have got there. It seems just possible some former Deputy Commissioner had had these hollows sowed with *tálí* seed, although there is no record of this having been done. In some places many of these and of much larger trees of other sorts were scorched and destroyed by the recent fires. Quercus incana *(varí)* grows in quantity in many places near though not quite at the top. It however but rarely exceeds 6-8 feet high and its being low and bushy so as not to be easily recognizable may account for the fact that on a recent occasion the acorns of this tree had been imported from the Himalaya to be sown on the hill.

Quercus.

Shrubs &c., on and near top

The following also were observed at or near the top of the hill. Chamærops, Ficus caricoides, Rhamnus Persica, an arboreous Zizyphus, (with leaves like Z. nummularia previously noted as found on Tilla) Gymnosporia, Edwardsia, Clematis orientalis (?), Jasminum revolutum (both glabrous and pilose forms). Rhus Cotinus, Buxus, Leptopus, Ballota, and Periploca. The following herbaceous plants likewise were noted on or near the top of the hill. Lepidium Draba, Viola serpens, Malva sylvestris (?) Hypericum speciosum, Astragalus multiceps, Morina Wallichiana, Scabiosa succisa, Silybum Marianum (?) Serratula pallida, Phagnalon denticulatum, Campanula sp:, Androsace rotundifolia, Vincetoxicum sp: Convolvulus saxatilis, Solanum nigrum, S. dulcamara (?) Verbascum Thapsus, Leptorhabdos parviflora, Barleria cristata, Salvia Moorcroftiana, Stachys parviflora, Thesium sp: Asparagus sp: and a large Arundinella (?)

Plants at 4,500.

Allium.

Ulmus.

Hedera.

Pine planted.

At about 4,500 feet Withania coagulans grew in a waste place, and up to this height or nearly occurred Pistacia, Cotoneaster obtusa *(síchú)*, Punica granatum (very rare) Gardenia tetrasperma, Plectranthus rugosus, Mimosa rubicaulis, Leptadenia Jacquemonti, Solanum sanctum, and a Liliaceous plant with great fascicled roots. About this height also in several places grows an undoubtedly wild species of Allium, very near the common Onion, and like it called *piyáz* or *gátta* (as well as *padwassal* which also means a kind of onion from the Persian *basl)* I afterwards found it at a considerably lower level 20 miles to the west. Dodonæa and Adhatoda did not seem to rise above 3,500 feet, and the following were not observed much above that: Celtis, Grewia oppositifolia, Lantana alba, Ichnocarpus sp., Cocculus Leæba, Peganum, Malcolmia strigosa and the lilac Brassica. About this elevation also were found one or two specimens of each of these three Himalyan plants: Ulmus *(erosa?)* Indigofera heterantha, and Hedera Helix. Along many of the paths about the higher part of the hill had been planted out many hundreds of young *chíl* (Pinus longifolia), raised here from seed brought from the Himalaya. Most of them were suffering (and many had died) from unshaded exposure in their young state to the full force of the sun. This has since been remedied, I believe much to the benefit of the survivors. The conditions here are by no means very favourable for planted trees, and beyond these *chíl* but little had been done in this way.

Descent from Sakesar.

On the early part of 5th April there was much rain but it cleared up in the afternoon, and I made out to reach Miánwáli Dok *(dok* means hamlet) close to the foot of the descent to the west and about 5 miles from the summit of the hill. The path of descent is fairly good and easy, and runs to the north of that great spur of Sakesar which is continued into the main Range to the west of that mountain. Towards the foot one leaves the limestone for sandstone and other more recent formations. The shrubby and other vegetation is very similar to that on the opposite side of the hill, the only novelty I observed being Flacourtia sepiaria (*jalkar*) which was common at places below 2,500 feet. The Dok itself may be 1,800 feet above the sea. Previous to my getting in, darkness had come on, and rain had recommenced, so that most of my baggage was much delayed. *Ad interim* I accepted the offer of shelter from a Mian of the place, and my servants were able to get me some dinner. The natives generally of this part of the Range are outspoken enough, but the demeanour of this Mian and his father was more frank, and I found their conversation more open than those of almost any native I have ever met "promiscuous." They discussed in the most free and easy and apparently honest way our system of managing the country, and the character of the various sahibs they had known. And in the morning when to my enquiry as to how my guide should be recompensed they said "never mind," and I told them that I did not wish to leave behind me a character for *zulm* like so and so sáhib whom they had been criticizing the night before, they laughed heartily at the idea. During the evening when asked if they thought it would be fair weather next day, they as usual with natives, declined to give any opinion, but on being pressed, they stated that the chief reason against that sort of thing with them is that it is *kufr* (heresy) to attempt to foresee the future, a curious Mussalman notion I was not till then aware of. I found from these people that snuffing is a much more common practice among them than smoking. The scarcity of timber to the south is shewn by the fact

Flacourtia Sepiaria.

Mianwàli Dok.

Outspoken natives.

that when they have occasion to go to Mianwálí on business it is worth their while to carry thither a bit of *kau* (Olea) to sell for ploughmaking &c.

Towards Nimmal.

Very bare tract

No Sajji

On 6th April, 10 miles to Nimmal, north-west from Mianwáli Dok, the start being somewhat delayed by bad weather, which however cleared up in the forenoon. The route left to the south the sandstone ridges of the northern belt of the Range (dipping steeply to the north,) in passing westward over undulating or tolerably level ground often among rounded low hills of shingle. On two of these to the right were plain square tomb-like structures said to be "very old." Both the ridges and these hillocks were excessively dry and bare, and although several small streams, tributaries of the Vahi, were crossed, the soil is here mostly very poor and sandy and almost no habitations or cultivation were seen till just at the end of the march I shall give a list of most of the plants noted on the way, especially as here-abouts a considerable change occurred in the nomenclature of plants. Flacourtia sepiaria (*jidkar*), abundant early, Ficus caricoides, occasional, but said not to fruit here, Grewia betulæfolia, Tecoma, common small, Ehretia aspera, occasional, Capparis aphylla *(karrí)*, Lantana alba *(kálí butí)*, Rhazzya stricta *(vena)* and Cocculus Leœba *(rechni)*. Zizyphus nummularia was frequent and stunted, Prosopis *(jandi)* common in places, its fruit said not to be eaten here. In some parts Salvadora was common, and several Salsolaceœ (especially Panderia pilosa, Chenopodium album, and Caroxylon fœtidum ?) were abundant, but I was told that no *sajji* is made in this neighbourhood. In and near some of the sandy stream-beds Tamarix Indica *(leinya)* is abundant, and T. orientalis *(rúkh)* occurred, rarely. These resemble each other very much but the latter has a greyish tinge, the former being a tolerably bright green.

Herbaceous plants.

The following herbaceous plants occurred. Malcolmia Africana, and a variety with very small flowers; M. strigosa *(chināka)* with a white-flowered variety previously found Trans Indus; the lilac Brassica *(bara chināka)*; Viola cinerea; Dianthus sp: Oligomeris glaucescens (not seen for many days previously but abundant now); Abutilon Indicum *(pilí buti)* Fagonia Cretica *(damiya)*; Lespideza sp: *(gūrpallí)* with a graceful pretty pink flower (previously got Trans Indus); Rhynchosia minima *(verí,* a name applied to many climbers) Scabiosa Olivieri *(būtí)*; Aplotaxis candicans *(kalí zírì,* said to be medicinal, and certainly furnishing part at least of the seeds so called, for Punjāb druggists); Scorzonera sp: *(dodak)*; Carthamus oxyacantha *(polí, kandiāra)*; Cousinia Calcitrapœformis *(kandiāri,* used as a vegetable), Lactuca auriculata *(trás)*; Nonnœa pulla; Heliotropium ramosissimum *(drekhan búti)*; Solanum sanctum; S. gracilipes *(kandiárí,* with a bitter fruit); Lallemantia Royleana (abundant and large); Plantago ciliata and P. decumbens? *(isafgol,* seeds medicinal); Boerhaavia procumbens; Ærua Javanica *(jāri)*; Pupalea lappacea *(ludhra)*; Rumex vesicarius *(khatt mítha,* a name which well expresses its sweetish sour taste); Ephedra *(nikki kúrkán)*; the Punjab Asparagus sp: *(kúchan)*; and Uropetalum (?) *(phaphor)*. The commonest grasses were Dactyloctenium Ægyptiacum and Eleusine flagellifera, which were profuse all over, and Panicum maximum was common in hedges &c, towards the end. The two most striking novelties met with were a glandular odorous Composite *(jálí búti)* which I had previously found Trans Indus, and Phelipœa Calotropidis *(khalátra)*.

Phelipœa

The latter was abundant at one place in a sandy brook-bed, under Tamarisk bushes. And here as sometimes elsewhere, there was no Calotropidis near (although it was common later) from whose roots it might spring.

Nimmal.

Nimmal is a considerable Village situated at about 1,170 feet above the sea, on one of the sandstone spurs close to the eastern bank of the Bakkh gap, in which the Vahi a considerable fresh water stream breaks thorugh the Range from north to south. In the stream above this, goldwashing was at one time carried on, and copper has been reported as found near this. I put up in a tolerably decent bungalow built for travellers outside the town. The water, trees and cultivation, with the busy little town close by, made the place refreshing after some of those I had been at. And some ruins perched on a rocky height on the opposite bank of the gap and about 200 feet higher than the bungalow improve the scene. Crotalaria Burhia (*khippi*) from which is made an inferior rope, was common here, and Echinops echinatus, Giesekia linearifolia and Farsetia Jacquemonti occurred.

Raja Sirkap.

Arid ridges and valleys

On 7*th* April some 15 miles along hot bare ravines and over arid ridges still hotter and barer, to Sok N. N. W. from Nimmal. On starting I first went over the old city on the height opposite. Nothing but the ruins of small houses are now visible, but the highest point is indicated as formerly the site of a palace of Raja Sirkap a noted hero of Punjâb tradition. Silene Leysseroides, a blue Linaria and Picridium tingitanum were abundant on the rock, and the last was frequent most of the way. For some miles the road was very uninteresting, and I kept along in the heart of the Range where there was hardly a path in most places, and not a sign of cultivation or inhabitants.—Wild sheep were seen at one place. Acacia modesta was the commonest shrub, but on the whole the ridges here were nearly as bare as any I have seen Cis-or Trans-Indus. Grewia villosa and Lantana occurred, and Rhazzya (*Venna*) was not uncommon. A medicinal tea is here said to be prepared from its leaves. There were a few Salvadora in some ravines, Atriplex laciniata was seen and various other Salsolaceæ were common locally. Among the smaller plants observed were Cleome, Ruta, Physorhynchus, Argyrolobium roseum, the smaller of the two species of Pluchea, Arnebia hispidissima, a curious succulent leaved Scrophulariaceous plant I had previously got at Peshawur, and Forskählia tenacissima. A small grass (Nardus stricta?) was abundant at one or two places.

Ascent of Trihaddi.

After crossing some deep glens with small streams, not very far from the village of Boodi khel, there was a tolerably gradual ascent, but no path, to the top of Trihaddi, i. e. three boundaries, the place where the lands of three villages meet. For five or six miles here again not a drop of water was seen, and the hill sides were stony and terribly bare, especially on the southern aspects, where excepting in clefts and ravines there was almost no vegetation but a few grasses. Prosopis occurs in valleys and Dodonæa is occasional on the ridges, but no Olea; Acacia modesta or A eburnea &c., were here seen. Lantana (*tút búti*) and the following herbs occurred mostly from 2,000 to 2,500 feet, the lilac Brassica, Hibiscus vitifolius, Fagonia, Crotalaria Burhia (only low), Cassia obovata (*saná*, its leaves used as a purgative) Taverniera, Echinops echinatus, Ipomæa sessiliflora, Scrophularia scabiosæfolia and Ærua scandens. Under 2,000 feet were seen a few plants of the wild Allium (*janglí piyáz*) but the roots are said to have a different flavour from that of the cultivated onion, and are not commonly eaten.

Saná Cassia.

Trihaddi.

The top of Trihaddi (3,477 feet) is very barren and bleak and the prospect exceedingly dreary. In this Manool ridge are several other peaks of nearly the same height and the parallel ridges on either side are not much lower and are about as bare as this. None of the more moist valleys or of the cultivated plains were in sight and the prospect was nearly verdureless. So I did not spend much time on the bare hill-top which presents an unpleasant contrast to even the less verdant of those further east in the Range. Buxus was common on the northern aspect near the top and Gymnosporia (*phúphári*) and Sageretia were occasional after this. After a considerable and pretty rapid descent there was some cultivation in a valley where in the fields Tulipa stellata (in fruit) was abundant. And near this Phlomis pungens (?), Scutellaria linearis (*mastúra*) and a fine handsome Astragalus (*ro-channa* i. e hill Cicer) were found. Astragalus multiceps occurred further on. Edwardsia was now frequent and Rhamnus Persica not uncommon. The fruit of the latter when eaten in quantity is said to affect the head. At a fine little stream in a deep glen almost bosky with vegetation, there were a good many pretty large trees of Ficus venosa (*war*) F. caricoides, Acacia modesta, Phœnix, Pistacia, Fluggea (*vănúthi*) Celtis (*rattaman*) Odina (*dila*) and Dalbergia, some of the last to 5—6 feet in girth. Adiantum Capillus Veneris was common by the stream and Marsdenia occurred. A steep climb up a rocky slope with much Ballota, brought me out of the deep glen on to an undulating little valley in which lies the village of Sok at about 2,506 feet. Flacourtia sepiaria (*dajkar*) was seen and Chamærops was common on some of the ridges near. Some mistake had occurred about my traps which necessarily had followed a road outside, on the northeast of, the Range. It was late before they came up, till which time I sat under a very fine tree of Acacia modesta 12 feet in girth.

Moist glen.

Towards Màri.
Migoch ridge.

On 8th April some 15 miles north-west to Màri on the Indus. I first climbed to the top of the steep Migoch ridge to the east of Sok. Here on Dheri (3,100 feet) there was but little of interest, and the prospect of red clayey hills below with a very barren plain beyond them was not cheering. I kept along near the summit of the ridge for some way. Flacourtia sepiaria and Zizyphus nummularia were common here, Periploca frequent and Cymbopogon laniger was abundant. A fœtid slender Rubiaceous plant, formerly got Trans-Indus, occurred, and I found that the natives eat the bitter Scutellaria linearis. There were but few shrubs on the upper part of the ridge where Grewia Rothii (*nikki bekkar*) Lantana, and Capparis spinosa (*kandiára*) were seen, as well as the following herbs;—Delphinum saniculæfolium, Physorhynchus (*akri*) Polygala arvensis, Linum strictum, Oxalis corniculata, the fine Astragalus got on the 7th, Rhynchosia minima (*veri*) and Silybum Marianum. Further down on the hill as well as on the low ridges to the north, Dodonæa and Rhazzya were common and Taverniera frequent.

Petroleum spring.

From the base of the north-eastern face of the ridge which I had left, issues at about 2,000 feet the petroleum spring of Kuraddi near the village of Jaba. One is warned of its vicinity by the strong "gas-work" smell which issues from the stream for some distance below the spring. Close to the latter the water and stones &c., are quite dark from the admixture, but further down are white and soapy looking. The substance is here called (not *gandak ka tel* or sulphur oil but) *lalira*. It is not in large quantity and is collected by putting into the spring a wisp of grass whence it can after accumulating be squeezed. The people told me that here it is applied for skin diseases of goats and camels only, not of man. Sulphur was formerly mined close to this for Guláb Sing but they professed to be unable to show the exact locality. Near the spring were one or two trees of Flüggea, the fruit of which is eaten and said to be sweet. About a couple of miles down the little stream which eventually joins the Kattawán, and along whose banks Nerium is not uncommon, lies the village of Jaba. In waste ground near it Withania coagulans (*Khamjíra*) was seen, the seeds of which are given to children for bellyache. In the Gambhir and Soán Streams to the north of this gold is got yellower

Jaba.

and therefore more esteemed than that found in the sands of the Indus into which they fall.

Plain to North of Range.

Gay coloured flowers.

Colocynth.

Saliferous tract.

For some miles of the rest of the way from Jaba the road lay along a flattish or undulating country traversed by the Kattawán stream and in places cut up by ravines. In low tracts there is at times a good deal of Acacia modesta &c. but for the most part the country is very bare and often stony, Salvadora and Capparis aphylla being the chief shrubs. But arid and stony as most parts were, the ground in many places looked like a flowery meadow from the abundance of smaller plants with gay coloured flowers. The predominant hues were reddish or lilac, as Goldbachia, Brassica, Fumaria, Cirsium arvense, Taverniera and Stachys. Blue was represented by Scorzonera, and Salvia Moorcroftiana, and yellow by Eremostachys, Edwardsia and Astragalus multiceps. Rhazzya was common, and Crotalaria Burhia, Tribulus terrestris and Heliotropium undulatum (*pránd búti*) abundant. In sandy parts Cucumis Colocynthis (*ghurúmba*) was common, its fruit being used as a purgative for horses. Near the Kattawán, which wound along in a wide sandy bed, Tamarix dioica and T. Indica were common in places for the last mile or two. After passing through a great gap in the main Range the road led among the very bare parti-coloured hills near Mári. Rottbœllia hirsuta was abundant on these, as well as the glandular odorous Composite, and a fleshy leaved plant of the same order, both of which I had found on similar formations Trans Indus. This part of the way was low, hot, and uninteresting, and I was glad to get into Mári.

Mári.

On 9th April. I halted at Mári to get some information about the Indus *deodár* &c. The town is a considerable one close to the left bank of the river at about 750 feet above the sea and has a

Madder root.

good deal of trade. I saw many camel loads of Manjít (the root of Rubia cordifolia) which had been brought from Affghanistan by the Povindahs through the Gomul pass to Dera Ismail khán and there bought by its present owner who was taking it to Huzara to dye the yellow stripes in the Hazarenes' turbans &c. The Indus here as further up is called "*Attak*" and the derivation I heard assigned for this name is not I think on record, *viz.* that Bába Nának coming to the river where there was no ferry said "Attak" (stop!) which it did and he got across without wetting his feet!

Tradition.

Mari hill.

A hill close to the city and over-hanging the river rises to some 200 feet above the latter. On the top are the ruins of a fine old temple and there is a good view of one or two bends of the river above the town, where it flows between steep craggy hills; as well as of the large commercial town of Kālabagh on the opposite (right) bank and the river flowing on to the sea through the plain below, with Shaikh Boodem and part of the Súlímán range in the distance. In part of this hill salt is mined. Here as well as at Kúsak and other saliferous places in the Range there is said to be a good deal of goitre. Another disorder guinea-worm (*narwa*) or *kirí* is common in parts of the Range though nowhere probably so prevalent as at Bokhara where Vambery states that one in ten of the inhabitants is at certain seasons affected or as in certain villages I saw recently in Sirsa district, where as many as 50 per cent of the inhabitants have guinea-worm in the rains. I think I found reason to doubt whether, as has been said, it only occurs in places in the Salt Range where men and cattle wash and drink indiscriminately from the *bannis* or tanks that have been alluded to as so common.

Goitre.

Guinea-worm.

Plants on hill.

On the Márí hill Suæda, Caroxylon and other Salsolaceæ, are abundant, and Forskählea is common and very large. Here also the odorous and the fleshy Compositæ and the thick leaved Scrophulariaceous plant formerly alluded to, were found in some quantity. Psoralea plicata, Crozophora tinctoria and a pretty little silky Stipagrostis, also occurred. But the Flora here is scanty and not very interesting.

Conclusion of tour.

As on the 10th April, I took boat to go down the Indus towards Shaikh Boodeen and Dera Ismail Khan the account of my Salt Range tour here comes to an end.

Plants collected.

I shall now give a complete list with some notes of distribution, of all the plants of the Salt Range collected by Dr. Aitchison, Dr. Henderson, or myself. My own trip was a short one but it embraced the whole length of the Range and was made at perhaps the best season of the year. I had for the first time in any of my trips, trained a man to do much of the mere mechanical work of collecting and drying specimens &c., so that not only was my labour lightened but I had more time for making general observations. The specimens of both Dr. Aitchison and Dr. Henderson were in first rate condition, and all those of the former have been identified at Kew. Most of the plants I got were in such a state as to be recognizable, but I have to regret that although a complete set were sent to England long ago I have not yet been able to get a list of certified names. Accordingly a good many are still doubtful.

Native names of plants.

All the native names I got are inserted, for which I am responsible, and some of Dr. Henderson's (marked H.), are also entered. These names are generally put in the order they occurred, as I went, from east to west. As usual with native names there is a great want of definiteness about these, there being several very different plants called by such names as *kandiāru*, the thorny, or *veri* the climber, *dodak* and *battal* applied to various milky Compositæ &c. Also here as elsewhere I frequently found that the same plant was called by very different names within a mile or two. Still I think it is well to record as many native names as one conveniently can, chiefly for the aid of those knowing little of plants who may merely want to identify some of them. I may note that European Officers sometimes tend to corrupt or render uncertain native names of trees or other plants; e. g. the pencil cedar of the upper Sutlej and upper Chenáb is by Europeans almost never called by the names it has in these habitats; Tamarix dioica is almost always called *pilchí* or *jhau* in tracts where *leinya* alone is known, and the Salvadora tree is still more frequently called *pílú* which by natives is restricted properly speaking to its fruit, and so on. With this preface, and reserving for the conclusion of the paper a few general remarks on the Flora, I now proceed to the list.

List of Salt Range plants Collected by Drs. J. E. T. AITCHISON (1), G. HENDERSON (2), *and* J. L. STEWART (3).

N. O.	Name of plant.	Collected by			Native Name.	Frequency, height above the sea in feet at which found, uses &c.
		1	2	3		
	Ranunculaceæ.					
	Clematis Gouriana, *Rox:*	1		3	*siāli.*	Only on top of Tilla 3,000.
	C. grata, *Wall:*		2	3		45 4,600 Sakesar only.
	C. orientalis, *L.*		2	3		2,000 Kutās, 45-5,000 Sakesar.
	Delphinium saniculæfolium, *Boiss*	1		3		3,000 Tilla, 2-3,000 west.
	Ranunculus arvensis, *L.*		2	3		About 2,000, occasional.
	R. muricatus, *L.*			3		At 2,000,
	R. scelèratus, *L.*		2	3	*chambal.*	do:
	Menispermaceæ.					
	Cissampelos Pareira, *L.*	1		3	*patāka.*	2,000-3,000 Tilla and Diljabba (Root said to be used as medicinal *piljari* ?? Hoshyarpore.)
	Coculus Leæba, *Forsk:*	1	2	3	*illar-billar* *billi, ieri, duz* H. *bakren* H. *rechṇī-*	Moderate height all over to 3,000 Tilla.
	Fumariaceæ.					
	Fumaria parviflora, *Lam:*		2	3	*pāpra.* H	Common, low. As a cooling medicine.
	Hypecoum procumbens *L.*		2	3	*markan.*	At 1 800-2,000.
	Papaveraceæ.					
	Papaver cornigerum *Stocks.*			3	*janglī post.*	Only low, 2,000.
	P. lævigatum.		2	3	Do. do. *post dodi-bacha.*	Do: not uncommon.
	Cruciferæ.					
	Arabis arenosa ?			3		At 3,000 Drengan.
	Brassica sp.		2	3	*barāni mulī.* *bibácha, bara chināka.*	at moderate heights all over to 2,500 Sakesar (and 4,500 Shaikh Boodeen, Trans Indus where it is eaten as a vegetable).

Capsella Bursa Pastoris, *R. Br.*			3	..	Abundant; low.
Farsetia Jacquemonti, *Hf. and T*:	1		3	..	All over to 2,500.
Goldbachia lævigata, *DC.*		2	3	*bathal, pálak* H.	All over to 2,200.
G. Sp. ?			3	*sem*	Centre and west, to 2,200
Lepidium Draba, *L.*	1	2	3	*chitti phūl wāla, kuradda,*	All over at moderate heights, and to 5,000 Sakesar ?
Malcolmia Africana, *R. Br.* and a small flowered variety.			3	*popit* H. *chanyāk* H.	Common at moderate heights all over (and to 4,500 Shaikh Boodeen).
M. strigosa *Boiss*: and a white flowered variety.	1	2	3	*patthra saunchar, pāchan,...* *bachak* H. *chināka,*	all over, to 3,500 Sakesar.
Neslia paniculata, *Desv.*	1		3	..	Locally, at moderate heights.
Physorhynchus Brahuicus, *Stocks,*	1	2	3	*jangli* or *barānī jamá* *kareli, chināka, akri,*	Common from 1,000, to 5,000 Sakesar. *Jamá* from its resemblance to mustard.
Sisymbrium Irio, *L*			3	*naktrūsa,*	Not uncommon, lowish.
S. Irioides, *Boiss* : ?			2	..	At 2,000.
S. Sophia, *L.*		2	3	*naktrúsi,*	Occasional, lowish.
Resedaceæ.					
Oligomeris glaucescens, *Camb* :			3	..	Not uncommon, low,
Capparideæ.					
Capparis aphylla, *Rox* :	1	2	3	*kari.* fruit *dila* (*tenti Aitch* :)	Common all over at moderate heights Wood close smooth-grained and "very bitter" Much used for rafters, Southern Trans Indus, white ants wont touch it.
C. spinosa, *L.*	1	2	3	*kaur, keri, taker, kiári,* *bauri, kandiára,*	Common on cliffs 1,200 to 3,000. Fruit in *achár* (*pickle*) "by Khatris only"
Cleome linearis, *Stocks* :	1			..	Low.
C. pentaphylla, *L.*		2		*hulhul.* H.	do :
C. Ruta, *Dne.*			3	..	In west at moderate heights.
					Crataeva Roxburghii nowhere wild in Range (or probably near it).
Flacourtianeæ.					
Flacourtia sapida, *Rox.*			3	*kakoa,*	At 3,000, Tilla only.

N. O.	Name of plants.	Collected by 1	2	3	Native Name.	Frequency, height above the sea in feet at which found, uses &c.
	F. sepiaria, *Rox* :			3	*jidkar, dajkar,*	1,800-2,500 Sakesar and near it only. Strong spines, "not even eaten by cattle."
Violarieæ.						
	Viola, cinerea, *Boiss.*	1	2	3	*chitī phūl wáli búti, mukni* H.	All over low to near 3,000 Tilla (and 4,500 Shaikh Boodeen)
	V. serpens, ...		2	3		Common 4,000-5,000 Sakesar.
Polygaleæ.						
	Polgala arvensis, *Willd.*	1	2	3		Occasional at moderate heights all over.
	P. oligophylla ?		2			Low, near Sakesar.
	P. Vahliana, *DC.*	1				Low.
	P. sp :		2			Low, near Sakesar.
Caryophylleæ.						
	Arenaria serpyllifolia, *L.*	2	3			At moderate heights.
	Dianthus sp :			3		In west, low.
	Gypsophila vaccaria, *L.*	1				In east, low.
	Sileneconica, *L.*			3	*Surāhi, dogar* H.	At moderate heights. *Surāhi* from its jug-shaped calyx.
	S. Leysseroides, *Boiss* :			3		At 2,000 in west.
Portulacaceæ.						
	Portulaca oleracea, *L.*			3		Common in waste ground, low.
	P. quadrifida, *L.*		2	3	*lún ke búti, lùnak, katti lúnak* H.	3,000 Tilla, 4,000 Patiála Eaten with sugar, or boiled with water and eaten with bread.
	Trianthema pentandra, *L*			3		Not uncommon, low.
Lineæ						
	Linum strictum, *L* :			3		In west, one place at 3,000.
	L. trigynum, *Rox* :				*kaur, gadbattal, arabtori* H.	At 2,000-3,000 occasional.
Malvaceæ.						
	Abutilon Indicum, *G. Don.*	1		3	*pili búti,*	Occasional all over to 2,500.
	A. sp : ?			3		At 2,500 Diljabba.

Hibiscus Gibsoni, *Stocks.*	1	2			At 2,000?
H. Triocnum, *L.*	2				At 2,000?
H. vitifolius, *L.*	1	2	3	*Siāli,*	Occasional 2,000-3,000, chiefly in east.
Malva parviflora, *L.*			3	*saunchal, gogi ság,* H	Common all over at moderate heights. Eaten as a vegetable in scarcity.
M. sylvestris, *L.* ?			3		At 5,000 Sakesar.
Sida rhombifolia, *L.*	1		3		Occasional all over at moderate heights.
S. sp : *a.*		2	3		At moderate heights.
S. sp : *b.*			3		At 2,500, in west.
Sterculiaceæ.					
Sterculia villosa, *Rox :*	1		3	*massú,*	At 2,000-3000 Tilla. Ropes made from bark.
Bombaceæ					
Bombax heptaphyllum, *L.*	1		3	*Sembal,*	At 2.500-3,000 Tilla (and 650 on island in the Jhelum),
Byttneriaceæ.					
Kydia calycina *Rox*	1		3	*púli,*	At 2,500—3,000 Tilla only.
Melhania abutiloides, *Arn :*	1	2	3		At moderate heights all over.
Tiliaceæ.					
Corchorus olitorius, *L.*			3		Occasional, to 3,000 Tilla.
Corchorus trilocularis, *L.*		2	3		Occasional, low.
Grewia betulæfolia *Juss :*	1	2	3	*kanger, ganger,*	1,800 3 000 all over Fruit eaten.
G. elastica. *Royle.*		2	3	*farri dhaman* H, *phalwa,*	Occasional 2,000-3000. Fruit eaten. Timber strong.
G. oppositifolia, *Ham :*		2	3	*dhaman, tamman,*	Not uncommon 2,000-3,000, Tilla and to 4,000 Sakesar.
G. Rothii, *DC.*	1	2	3	*bather, gargas, nikki bekkar,*	Occasional 2,500 3,000 Tilla and in west, rarely eaten
G. villosa, *Roth.*	1	2	3	*jalidar, kaskúsri, thamther,*	Frequent 2,000-2,500 all over. Fruit eaten.
G. sp :		2			At 2,000 ?
Hyperineæ.					
Hypericum speciosum.		2	3		At 3,500-4.500 Sakesar. Melia azidirach very rare in Range, and nowhere wild.
Sapindaceæ.					
Cardiospermum Halicacabum *L.*		2			At 2,000 ?

N. O.	Name of plants.	Collected by 1	2	3	Native Name.	Frequency, height above the sea in feet at which found, uses &c,
	Dodonæa Burmanniana, *D.C.*	1		3	*sanatta, santa,*	Abundant from 2,000 all over to 4,500 Sakesar. Branches for thatching. Rarely eaten by cattle.
Ampelideæ.						
	Vitis carnosa, *Wall* :	1	2			Occasional 2,000-3,000.
	V. vinifera, *L*	1	2	3	*dák.*	Occasionally half-naturalized 1,200-2,000.
Geraniaceæ.						
	Erodium cicutarium, *L.*			3		At 1,800-3,000 near Patiála only.
	E. maritimum, *L, Her* :		2	3		Occasional 2,000, to 3,000 Diljabba.
	E. sp :			3		At 2,400.
	Geranium lucidum, *L.*	1		3		At 2,000-3,000 Tilla and east.
	G. rotundifolium, *L.*	1		3		Do : Do : Do
Oxalideæ.						
	Oxalis corniculata, *L.*		2	3	*Khatta mitha, khattitan,* H.	Occasional all over, to 3,000 Tilla. Named from *khatta* sour.
Zygophylleæ.						
	Fagonia Cretica, *L.*			3	*jangli jamá, damiyá* H.	Abundant low, to above 2,300 in west
	Tribulus terrestris, *L.*		2	3	*bakkra.*	Abundant all over to moderate heights. Seeds eaten and young plant used as a vegetable.
Rutaceæ.						
	Peganum Harmala, *L.*			3	*harmal.*	Not uncommon all over, to 2,800 Sakesar (and 4,500 Shaikh Boodeen) Burned seeds medicinal, or their smoke ?
Celastrineæ.						
	Gymnosporia spinosa, *Hook : fil* :	1	2	3	*patáki, kander, phúphari,*	Abundant all over, to 5,000 Sakesar. Smoke of seeds for toothache. Chief name *patuk* from the crackling of its fruit when ripe.
Rhamnaceæ.						
	Ceanothus flavescens ?		2	3		At 3,000-4500 Sakesar.
	Rhamnus Persica, *Boiss* :	1		3	*dalidar, kúchni, jalidar nikki kandur.*	Common all over 2,000, to 5,000 Sakesar. Fruit eaten, but in excess affects the head.

Sageretia Brandrethiana, *Aitch* :	1	2	3	*koher, goher, kohen,*	Frequent at 2,000 3 000. Fruit pleasant and sweet, and is made into *chatni.*
S oppositifolia, *Brongn* :		2	3		At several places about 2,000. Doubtful
Zizyphus Jujuba *Lam* :			3	*ber,* (grafted *pewandi* H).	To 3,000 not uncommon very doubtful if wild. Fruit eaten Largest tree 11 feet girth.
Z. nummularia, *W* and *A*.	1		3	*birota, ber, mallā*?	Not uncommon, to 3 000 Sakesar. Fruit eaten.
Z. vulgaris, *Lam* :	1	2	3	*amriā, amlai, amra, imla*	Common many places, to 4 000 Patiala. Fruit sour, but eaten. Name from *amlá* sour.
Z sp : (var : of Z Jujuba?)		2	3	*kokan,*	Tree, like Z nummularia. Near 3,000 Tilla, rare. Fruit similar to Z jujuba, not so good.
Moringaceæ.					
Hyperanthera pterygosperma *Gært* :	1		3	*soanjna,*	Rare, at moderate heights. Probably nowhere wild in Range Branches lopped for cattle?
Anacardiaceæ.					
Odina Wodier, *Rox* :		2	3	*kamlai, kamlia kāmbal, dila.*	Common. Tilla, and occasional all over 2,000-3,000. Useless.
Pistacia integerrima, *Hf.* and *T.*	1	2	3	*kakkrai, khangai, kakkar,* H.	Frequent from 1,500, to 4,500 Sakesar, up to 6 7,' and one tree of 12' girth seen Young leaves are browsed by camels. Horn-like galls are used medicinally. Furnishes zebra wood.
Rhus Cotinus, *L.*		2	3	*largá,*	Common 3,000 4,500 Sakesar only.
Spondias mangifera?		2			Low near Sakesar. Doubtful
Leguminosæ.					
Acacia Arabica, *Willd*	1		3	*kikkar,*	Below 2,000, rare even in east, unknown in west and to north of Range.
and cupressiform variety.					Not uncommon under eastern end of Range. Common in various parts of the Punjab and Sind (*kābuli kikkar*), and in parts of Bombay (*Ram kanta*) On many young rapid growing shoots of A A. the spines are much larger than usual, but Dr. Aitchison's var: spina albida, has no existence, so far as Dr. Henderson and I know.

N. O.	Name of plant.	Collected by 1	2	3	Native Name.	Frequency, height above the sea in feet at which found, uses &c.
	A eburnea, *Willd* :	1	2	3	*kikkar dadda, babuli*, ..	Common many places at various heights, to 3,000 Sakesar.
	A modesta, *Wall* :	1	2	3	*phulá, phulái*, . .	One of the commonest trees in the Range, all over up to above 3,000 (to 4,500, Shaikh Bood-een) Grows on driest rockiest ridges, and is only "stunted" on some of these, from being lopped and cut down. Wood useful for purposes requiring hardness and some strength Protected trees in villages not uncommon to 6,' largest tree seem 12' girth
	Acacia speciosa, *Willd* : ..			3	*sirin*, ...	This the *siris* of Hindostan is I think unquestionably wild on Tilla, but even planted trees are excessively rare to the west. Name a Punjab corruption of *siris*.
	Alhagi Maurorum, *DC.* ..	1	2	3	*tamiya*, ...	Common low, all over. Name a Panjabi corruption of *dhamiya*.
	Argyrolobium roseum, *Jaub* : *and* sp :			3		Occasional at 1-500-2,000.
	A, uniflorum, *Jaub* : *and* sp : ..	1			. ... ..	On Tilla.
	Astragalus leucocephalus, *Benth* :	1	2	3	... . .	Tilla and at 4,500-5,000 Sakesar.
	A. multiceps, *Wall* :	1	2	3	*tināni, tinni, jandi, duddan*,	Abundant many places 2-3,000, occasional to 4,000 Patiála, and 5,000 Sakesar. Calyx has a pleasant, sweetish taste and is eaten.
	A. prolixus ?		2		*gorphalli* H.	At 2,000 ? name from *phalli* a pod.
	A. tribuloides Del.			3		Not uncommon all over 1,000 to 2,000.
	A. sp : *a*			3		Occasional all over 1,000 to 2,000.
	A. sp : *b.*			3		do. do. od.
	A. sp : *c.*			3		do do. do.
	A. sp : *d*			3	*ro-channa*, . ..	At 2,000-3,000, in west. Name from *ro* a hill

					and *chana*, Cicer arietinum, which it somewhat resembles
Bauhinia variegata, *L.*		2	3	*kolar*	Occasional at 3 000 Diljabba and 3,000 3,500 Sakesar
Butea frondosa, *Rox.*	1	2	3	*chichra (dhák)*	Occasional east and central 2 000, and about 3,000 Tilla and Diljabba Absent in west (and though abundant in places under east end of Range and between Rhotás and Búkrála ranges, it is almost unknown to west of latter) Is held as a sign of fertile soil by natives, who in some places even say it clears land of saline *kallar*
Cassia obovata, *Wall*		2	3	*sana*	At 2 000 2,500 in west Leaves used as a purgative
C mimosoides, *L*	1				On Tilla
Crotalaria Burhia, *Ham*	1	2	3	*khippi*	Common in west and centre and occasional in east low An inferior rope is made from it, locally, by dry process Root seems to be used medicinally
C. medicaginea, *Lam*		2			Near Sakesar, low
C sp		2			do do
Dalbergia sissoo, *Rox*	1	2	3	*tali*	Common planted all over, low Largest tree seen 6' girth Abundant naturalized in plains on and near Range Apparently wild near 3 000 Tilla and in some numbers at 45 5,000 Sakesar Dr Aitchison is very likely to be right as to the extreme improbability of this tree having ever been so common as the Natives say Such traditions are not uncommon in the Province and are generally unsupported by evidence
Edwardsia Hydaspica, *Edge*	1	2	3	*kun, malan, kohen.*	Common many places about 2 000 especially in centre and west and occasionally higher, to 5,000 Sakesar. Is said to poison all animals

N. O.	Name of plant.	Collected by 1	2	3	Native Name.	Frequency, height above the sea in feet at which found, uses &c.
						who browse on it, except perhaps goats.
						Guilandina Bonducella not at all likely to be wild in the Range as Dr. Aitchison hints.
	Indigofera arborea, *Rox* :			3	*kinthi.*	Not uncommon 3,000 to 5,000 Sakesar.
	I Gerardiana ?			3		Occasional 3,200 Sakesar.
	I. Senegalensis.		2			Near Sakesar.
	Lespedeza cuneata, *Don.*	1	2			On Tilla and Sakesar above 2,500
	L. sp :			3	*gurpalli.*	In west below 2,000, rare.
	Medicago denticulata, *Willd* :			3		Occasional, low.
	Melilotus parviflora, *Desf* :			3		All over. lowish.
	Mimosa rubicaulis, *Lam* :	1	2	3	*alla.*	Rare 2,000-3,000 Tilla and 3,200-3.600 Sakesar. A scrambling shurb, and not fit for timber (see Aitchison).
	Mucuna sp :		2			Near Sakesar. Seeds purgative.
	Phaseolus trilobus, *Ait.*	1				On Tilla.
	Prosopis spicigera, *L.*	1		3	*se, jand* (v).	Under 2,000 very rare in east and centre commoner in west. Young fruit said not to be eaten in Range as it is in many places. Wood used for well *chucks* to south of Range.
	Psoralea corylifolia, *L.*	1		3		Occasional about 2,000, towards east.
	P plicata, *Del* :		2	3		Occasional under 2,000, centre and west.
	Rhynchosia minima, *DC.*			3		Occasional low.
	Taverniera numumlarifolia, *DC.*	1		3	*kathi, bephalli, sichū, kinthi.*	Occasional all over 2,000, to 3,600 Sakesar.
	Tephrosia purpurea, *Pers* :		2			Near Sakesar. Abundant locally east and south of Range. Rare or absent to north.
	T. tenina, *Wall.*	1				Tilla.
	Trigonella incisa, *Royle.*		2			Near Sakesar.
	T. sp :			3		A. 4,500 5 000 Sakesar.
	Vicia sativa, *L.*			3		Occasional, low.
	Vigna carinalis, *Benth*	1				Tilla, near 3,000.

Dubia. *a* (Lespedeza ?			3	....	....	At 1,500 2,000 in west
do *b.*		2	3	....	....	At 3 000 5 000 Sakesar
do *c.*			3	....	....	At 5,000 Sakesar
do *d.*		2		....	....	Near Sakesar
Rosaceæ,						
Cotoneaster obtusa, *Wall.*		2	3	*sīchū, jalıdar* H.	....	At 4,000 4,600 Sakesar
Potentilla supina, *L.*			3	....	....	Occasional 2,000
P sp :		2	3	....	....	At 4 000 Sakesar
Onagrarieæ,						
Epilobium sp :		2	3	....	....	At 2,000-2,400 in centre
Lythrarieæ,						
Grislea tomentosa, *Rox.*	1		3	*táwī, dáwī,*	....	Occasional all over, 2,500 3,000 Tilla, to 5000 (?) Sakesar (and on islands in Jhelum and Indus) By no means confined to sandstone Flowers used as a dye
Myrtaceæ,						
Punica granatum, *L.*	1		3	*darūnī,*	....	At 3,000 Tilla and 4,500 Sakesar, I believe wild (Found wild on Trans Indus hills)
Sizygium Jambolanum, *DC*		2		*jāman,*	...	Near Sakesar. Very doubtful if wild anywhere in Range.
Tamariscineæ,						
Tamarix dioica, *Rox.*		2	3	*pilchī, leinya, kachlei,*	....	Occasional all over in low places. With the others is useful in roofing &c.
T. Indica, Rox : (Gallica, *L*)	1	2	3	*koā, rūkh, leinya,*	...	do, do, do,
T. Orientalis, *L.*		2	3	*rūkh,*	...	Rare, in west There is some doubt as to these sp : of Tamarix.
Cucurbitaceæ,						
Bryonia umbellata, *W.* and *A.*		2			....	Near Sakesar
Cucumis Colocynthis, *L.*	1		3	*ghūrūmba*		Occasional all over low (to 2500 Shaikh Boodeen) As purgative to horses, (and men)
Luffa amāra, *Rox.*	1				....	Tilla &c. wild ?
Momordica dioica, *Rox.*		2		*kirara,*	....	Near Sakesar, low
M sp :		2			....	do. do.
Dubia *a*		2		....		do. do

N. O.	Name of Plant.	Collected by 1	2	3	Native Name.	Remarks
	do. *b.*		2			do, do,
						Cactus Indica. A few introduced plants at one or two places.
Mesembryaceæ,						
	Orygia trianthemoides,			3		Rare, low.
Illecebreæ						
	Herniaria hirsuta, *L.*		2	3		Occasional all over 2,000 2,500.
	Spergularia maritima,			3	*mūrkní* H.	At 2,000 3,500 Sakesar.
Umbelliferæ,						
	Eryngium dichotomum Desf?			3		At 2,000 in West ! Doubtful
	Pimpinella crinita, Boiss.:			3	*balajwāin,*	Frequent all over low, in sandy ravines &c. Seeds for bellyache.
	Ptychotis coptica D. C.		2	3	*balajwain,*	Occasional at 1,800 2,000. Seeds valued in medicine.
	Torilis nodosa L.		2	3	*ajwain* H.	Occasional at 2,000.
						Some of the above species of umbelliferæ are doubtful as to identification
	Dubia *a.*		2	3	*balajwain.*	Occasional all over, and abundant in west on stony slopes to 2500,
					(*ajwáin* is the cultivated Ptychotis ajowan,)	
	Do. *b.*			3		At 4,500 5,000 Sakesar.
Araliaceæ,						
	Hedera Helix L.			3		One plant in fruit in a shady ravine at 3,200 Sakesar.
Rubiaceæ,						
	Galium aparine L.	1	2	3	*kúdhri,*	By no means confined to 3,000 Tilla (Aitchison) but common in many places down to 1,800 (and common in plains of extreme north west Punjab).

Gardenia tetrasperma, Rox : ..	1		3	....	....	....	At 3,000 Tilla and 2 000-5,000 Sakesar.
Hamiltonia suaveolens, Rox : ..	1	2	3	....	....	....	At 2 500 3,000, Tilla (and on island in the Jhelum).
Hedyotis aspera. Heyne	1		3	....	....	....	Tilla at 2,000-3000, at 5,000 Sakesar.
Musaenda sp :			3	....	....	....	On island in Jhelum. Doubtful if found in Range
Dubia *a.*			3	....	....	....	At 4,500-5000 Sakesar.
do *b.*			3	....	....	....	At 2000 in west.
Dipsacaceæ,							
Morina Wallichiana, Royle ..			3	....	....	....	At 5000 Sakesar.
Scabiosa Olivieri, Coult, ..		2	3	....	....	....	Common in west, at 2000-2500
S succisa L.		2	3	....	....	....	At 3,500-5,000 Sakesar.
Compositæ,							
Adenostemma sp :		2		....	....	....	Near Sakesar low.
Aplotaxis candicans D.C. ..		2	3	*kálizíri,*	....	....	Common at places from 1,800 to 5,000 Sakesar. Seeds used as medicine under this name.
A. sp : ?			3	....	....	....	At 1,800 in west, common, and 4,000 Sakesar ?
Artemisia Indica, Willd : ..			3	....	....	....	Abundant to 5,000 Sakesar, from plains ?
A. scoparia W. and K. (elegans Rox)		2	3	*lanwgi* H.	....	....	From plains. to 5,000 Sakesar.
A. vestita, Wall :		2	3	....	....	....	At 5,000 Sakesar.
A. sp : *a.*		2		....	....	....	Near Sakesar.
A. sp : *b*		2		....	....	....	Do,
Berthelotia lanceolata D.C. ..		2	3	*reshmi* H.	....	....	Not uncommon all over, low. Name "silky" from soft-looking leaves
Bidens bipinnata L. ..	1	2		....	....	....	On Tilla and near Sakesar.
Blainvillea latifolia D.C. ..		2		....	....	....	Near Sakesar.
Carthamus oxyacantha ..			3	*poli, kandiári,*		....	Not uncommon all over low. Seeds parched and eaten (as are those of the cultivated C. tinctorius, also called *poli*)
Centaurea Calcitrapa L. ..		2	3	*kandiára,*	....	....	Occasional, low.
Cirsium arvense, Scop : ..			3	....	....	....	Abundant in fields te moderate heights
Cousinia calcitrapæformis, D.C.		2	3	*jangli poli, kãndiãri,*		..	Occasional all over, low. Plant eaten as a vegetable.

N. O.	Native of Plant.	Collected by			Native Name.	Remarks.
		1	2	3		
	Echinops echinatus, Rox:		2	3	*le, sehor*, H. *kandiara* H.	Common in west and centre, low.
	Eclipta erecta L.		2			Near Sakesar.
	Erigeron Canadensis L.		2	3		At 3,000 Patiala, 2,500 to 5,000 ! Sakesar.
	Filago Germanica L.			3		All over at moderate heights.
	Francœuria, Crispa, Cass:			3	*phatmcr,*	Occasional at 2,000 and 5,000 ? Sakesar. Dried plant bruised and applied to injuries in cattle.
	Gnaphalium luteo-album L.	1	2	3		Occasional, low.
	Inula oblonga D.C.		2	3		Not uncommon from 2,500, and to 5,000 Sakesar.
	I. vestita. D.C.	1				At 3,000 Tilla (?, a misprint for preceding ?)
	Koelpinia sp: ?			3		At 2,000-2,500 towards west.
	Lactuca duriculata D C.		2	3	*trús,*	Not uncommon below 3,000.
	L. sp: ?		2		*bathal.*	At 2,000, near Sakesar.
	Microlonchus divaricatus, D.C.			3		Occasional, low.
	Microrhynchus nudicaulis Less:			3		Common all over, low.
	Phænopus sp: ?			3	*ganháli*	Occasional at 2,000 2,500, Seeds for belly-ache.
	Phagnalon denticulatum: Dne.		2	3		At 3,500 Patiala and 3,400-4,500 Sakesar.
	Picridium Tingitanum Desf:	1	2	3	*batthal, vattal,*	Common at 1,500-2000 all over and to 3,500 Sakesar.
	Pluchea sp; *a.*	1	2	3		Common at 1,000-1,500 on saliferous formation To two or three feet high, more massive than the next
	P. sp: *b.*	1	2	3		Do, do. A smaller plant. Found Trans Indus also.
	Saussurea sp ?		2	3		At 4,000-5000 Sakesar.
	Sclerocarpus Africanus, Jacq:	1				Near 3 000 on Tilla.
	Scorzonera sp:			3	*dodak,*	Common, chiefly in west, at 2,000-2,500.
	Senecio pallens, Wall:		2	3		At 2,800 to 5,000 Sakesar.
	Serratula pallida D C.		2	3		At 4,000 Patiala and 4,000 5000 Sakesar.
	Silybum Marianum, Gært:			3		At 2,000 in west and 5,000 Sakesar ? Doubtful, as specimens were young, but this plant occurs in the plains of extreme north west Punjab.

Sonchus arvensis L.			3		Common at moderate heights all over
S. sp:			3		At 2,000.
Taraxacum officinale, Wigg.		2	3	*dúdh bhatal, batthal,*	Not uncommon at 2,000, to 3000 Diljabba. Plant eaten as a vegetable.
Trichogyne cauliflora D.C.			3		Not uncommon, low.
Xanthium Strumarium L.		2	3		Occasional, low.
Dubia, *a*.		2			Near Sakesar.
Do, *b*.			3		At 2,500 in west, to 5,000 Sakesar.
Do, *c*.		2			Near Sakesar.
Do, *d*. (Othonna?)			3		At Mári 1,500, only.
Do, *e*.			3		In west, common, low.
Campanulaceæ					
Campanula canescens Wall:	1				At 3,000, Tilla.
C. sp:		2	3		At 4,000 Patiála, and from 3,000 5000, Sakesar.
Primulaceæ,					
Anagallis arvensis L. β. cærulea.			3	*dhabbar* H.	Not uncommon all over at moderate heights.
Androsace rotundifolia, Ham:		2	3		At 4,000 Patiála and 5,000 Sakesar.
Samolus Valerandi L.	1		3		Occasional at 2,000.
Myrsinaceæ,					
Myrsine Africana, L.		2	3	*papri, vávarāng,*	At 4,000 Patiála, and 3,000 5,000 Sakesar. Seeds given medicinally for small intestinal worms (under name of *bebrang-vávarang*). Name *papri* from its resemblance to box.
Reptonia buxifolia, A.D.C.			3	*garar,*	Abundant for some miles near Jallár Kahár and on Sakesar about 2,200 Fruit eaten (the *gurgura* of northern Trans-Indus where the plant is still more common, and where it was first found by Falconer.)
Oleaceæ,					
Olea Europæa, L.	1	2	2	*kau,*	Abundant all over at 1,500-3500 (to 5,000 in Himalaya). Many protected trees to 6-7, feet girth, two largest seen 11 and 12 feet. A very useful tree furnishing a hard close grained toughish wood, and leaves eagerly eaten by cattle.

N. O.	Name of Plant.	Collected by			Native Name.	Remark.
		1	2	3		
Jasmineæ,						
	Jasminum grandiflorum, *L.* ..	1		3	*chamba,*	On Tilla only over 3,000, *possibly* introduced.
	J. revolutum *Sims.* and pilose variety, ...		2	3	*chamba,*	Drengan at 3,000, Sakesar at 3-5000.
Apocynaceæ,						
	Carissa diffusa, *Rox:*	1	2	3	*garinda, garanda,*	At 3,000. Tilla, (and in central tract by Dr. Henderson)
	Ichnocarpus sp: ?			3	.. ..	At 3-5000, Sakesar.
	Nerium odorum, *Sol:* . :	1	2	3	*ganíra, kanhíra,* .. .	Common all over near water. Said to be poisonous to most animals-but to be eaten by goats.
	Rhazzya stricta, *Dne.* . ..	1	2	3	*wani, vinna, venna,*	Common many places, especially towards west up to 2,700. Leaves steeped in water for days are eaten by goats. A medicinal tea is prepared from the leaves, and bruised they are applied to children's eruptions.
Asclepiadeæ,						
	Boucerosia Aucheri, *Dne.* ..	1	2	3	*charanīglī, charínglí,* . ..	Occasional, to 3,000 Tilla. Bitter and carminative, frequently eaten. B. edulis? *chūng, pippa,* a much taller plant appears to be found in the *Bar* to the South and has similar properties
	Calotropis procera, *R. Br:* ..			3	*ak,*	Common in places to moderate heights (and to 3,500, Shaikh Boodeen).
	Ceropegia esculenta, ...		2			Near Sakesar, low.
	Cryptolepis sp: ?.. . ..			3	. ...	On Tilla at 2000.
	Dœmia extensa, *R. Br:* . ..	1	2	3	*siáli trotú,*	Occasional about 2,000.
	Leptadenia Jacquemonti, *Dne.* ..		2	3	*kújna H,*	Sakesar at 3-4,500
	Marsdenia Roylii, *Wight.* ..			3	*tar, verí,*	Occasional about 2-2,500. Young fruit bruised, is used as cooling medicine.
	Orthanthera viminea, *Wight.* ..			3	.. ..	Doubtful at 1,000.

Oxystelma esculenta, *R. Br* : ..			3	..	.	..	..	Occasional low,
Pentatropis spiralis, *Edgew* : ..			3	..	..	...	..	In low gorges and to 3,000 Sakesar
Periploca aphylla, *Dne.* .. .	1	2	3	*bāta*, ..	..	..	..	Common many places all over, to 5,000 Sakesar. Young fruit eaten in some parts, raw, cooked or as pickle.
Vincetoxicum sp :		2	3					Occasional in west. 2,500, to 5,000 Sakesar.
Bignoniaceæ,								
Amphicome Emodi, *Royle*. ..	1		3					Occasional 2,500–3000 in east (but also found Trans-Indus).
Tecoma undulata, *G. Don* : ..	1	2	3	*lahūra, rahura, rohira,*			..	Occasional, to 2,500 Tilla Dr Henderson believes there is a narow-leaved variety, but there are many gradations in this respect.
Convolvulaceæ,								
Convolvulus arvensis, *L.* .. .		2	3	..	.	...	.	All over, low
C. pluricaulis. Choisy, . ..			3	...	..	..	..	At 3,500 ? Sakesar.
C. saxatilis Vahl ? ..	1		3	..	.	..	..	Not in east 3,000 Patiála, and 5000 Sakesar.
C. sp.				..	.	...	..	At 2-3,000, centre, and 4000 Sakesar
Cuscuta reflexa, *Rox.*		2	3	*nīratār*,	..	..	...	Near 3000 Tilla, on Adhatoda. Ashes applied externally. and seeds medicinal.
Evolvulus alsinoides, *L.* .		2	3	..	..	..	..	About 3000 Tilla, and in west (and in plains ?)
Ipomœa muricata, *Rox.* .. .	1			..	..	..	.	Tilla.
I. pilosa Chois. . ..	1			..	..	...	..	At 3,000 Tilla.
I. sessiliflora, *Roth.* ..		2	3	..	..	..	..	At 2,500 in west and Sakesar.
I. sp		2		.	..	.	..	Near Sakesar.
Pharbitis Nil, *Chois.*	1	2		..	...	.	..	At 3000 Tilla, and Sakesar.
Loganiaceæ,								
Buddleia Neemda, *Ham.* ..			3	..	..	..	.	On island in Jhelum ; in the Range ?
Boragineæ,								
Anchusa hispida, *Forsk.* ..			3	...	..	...	..	Below 2,000 all over, occasional.
Arnebia hispidissima, *D.* ..			3	..	..	..	..	In west low. A. echioides (the prophet's flower) does not seem to extend so far east as the Range.
Bothriospermum tenellium, *F & M.*		2	3	*lūdri H.*	..	..	..	Occasional all over, low.
Cordia latifolia, *Rox.*			3	*lasora*,...	..	..	.	To 3,000 Tilla, very doubtful if wild.

N.O.	Name of Plant.	Collected by			Native Name	REMARKS.
		1	2	3		
	C. vestita. *Hf. and T.*	1		3	*karúk,*	Two trees at 2,500 on Tilla. Probably planted. C. angustifolia (Rothii) is common planted to the south, not seen in Range, or to north of it.
	Cynoglossum micranthum *DC.*		2	3		At 4,500 5,000 Sakesar.
	Ehretia aspera, *Rox:*	1	2	3	*sakkur, saggar, baddi kander, dhaman, H. ganger,*	Not uncommon, to 2,600 Tilla. Fruit is eaten and bark is said to be ground to mix with flour in time of dearth.
	Heliotropium Europæum, *L.*			3		Occasional, low.
	H. strigosum, *Willd:*			3	*sufed-bangra, H.*	Do. Do.
	H undulatum, *Vahl.*			3	*drekhan-buti, prind-buti,*	Occasional in west at 1,000 2,000.
	Lithospermum arvense, *L.*	1	2	3	*ardúsi avgari H.*	Occasional all over at moderate heights.
	Nonnæa pulla *DC.*			3	*kirmár,*	Do. Do. Name, "insect-killer."
	Onosma echioides, *L.*		2	3		At 3,000 5,000 Sakesar.
	Trichodesma Indicum, *R. Br:*		2	3	*kauri-buti,*	Occasional all over, to 5,000 Sakesar.
Solanaceæ,						
	Datura stramonium, *L.*		2		*dhatúra,*	Near Sakesar *very* doubtfully wild.
	Physalis minima, *L.*		2		*lilabosa, H.*	Near Sakesar.
	Solanum dulcamara, *L.?*		2	3		At 3,200. Sakesar. Doubtful?
	S. gracilipes, *Dne.*	1	2	3	*Kauri-buti, kandiuri,*	Common all over at moderate heights. The small bitter fruit is eaten, and the juice of young leaves is applied for inflammation in the ear. Is found Trans-Indus also.
	S. nigrum *L.*			3	*Kúch-mách,*	Common all over, to 3,000. Fruit is eaten.
	S. sanctum *L.*		2	3	*buri-maukuri, mavhari, mahori,*	Occasional all over, to 3,000 Tilla, and 4,500 Sakesar Fruit eaten raw and in pickle.
	S. xanthocarpum, *Schrader,*			3	*chhoti mankari, manhari, mahori,*	Do. Do. to 4,500 Sakesar. Fruit in pickle, and leaves in inflammation of ear.

Withania coagulans *Dun*:	1	2	3	*khamjira*	Occasional all over, to 4,500 Sakesar.
W. somnifera *Dun*:		2	3	*aksan, assan* H.	Not uncommon all over at moderate heights. Root bruised and given to cattle for a disease called *ták*. Root used for criminal abortion. Name a corruption of *asgand*.
Dubia.		2			Near Sakesar.
Scrophulariaceæ.					
Antirrhinum Orontium *L.*		2	3		Occasional all over, low.
Celsia Coromandeliana, *Vahl.*	1		3		Common all over, low
Herpestis monnieria, *H. B. K.*	1	2	3		Common at wet places all over, low.
Leptorhabdos parviflora, *Benth.*		2	3		At 5,000 Sakesar.
Linaria ramosissima, *Wall:*	1	2	3		Not uncommon all over to 2,500.
L. sp: *a.*		2			Near Sakesar.
L. sp: *b.*		2	3		Occasional to 2,500 in west and centre.
L. sp: *c.*		2			Near Sakesar.
Lindenbergia urticæfolia, *Lehm:*	1	2			On Tilla, and near Sakesar.
L. sp:		2	3		Occasional in west and centre to 2,500.
Mazus rugosus, *Lour?*		2			Near Sakesar
Mimulus gracilis *R. Br:*		2	3		Occasional all over, low.
Scrophularia scabiosæfolia *Benth*			3	*laphra.*	Not uncommon all over, to 3,000 Diljabba.
Striga euphrasioides, *Benth.:*	1				On Tilla
Verbascum Thapsus, *L.*		2	3	*karáthri, gúrganna, rewand Chíní,*	Not uncommon all over, to 5,000 Sakesar; *Rewand chini* is name of rhubarb root.
Veronica agrestis, *L.*		2	3	*aphrání, H.*	Common all over low.
V. anagallis, *L.*			3		Occasional all over, low, at wet places.
Dubia, *a.*			3		Occasional all over, to 2,500, in centre & west.
Dubia, *b.*			3		At 2,000 in west only.
Orobanchaceæ.					
Phelipæa calotropidis *Walp:*			3	*khalátri, khúrjín*	In west, low, on Tamarix.
Acanthaceæ.					

N.O.	Name of Plant.	Collected by 1	2	3	Native Name.	REMARKS.
	Adhatoda vasica, *Nees.*	1	2	3	*bhekkar.*	Abundant all over, to 3,000 Tilla. 3,500 Sakesar. Useless and very rarely browsed even by goats.
	Barleria cristata, *L.*	1	2	3		Occasional all over, to 5,000 Sakesar.
	Dicliptera Roxburghiana, *Nees.*		2	3		do, do, to 3,000, Tilla.
	Dipteracanthus prostratus, *Nees.*	1	2			Occasional, Tilla and near Sakesar.
	Peristrophe bicalyculata, *Nees.*			3		At 3,000 Tilla.
	Rostellaria peploides, *Nees.*		2	3	*angari, H.*	Occasional all over, low.
	Dubia		2	3	*khakri, baráni poli* (?)	Occasional at 1,000-2,000, centre and west.
Verbenaceæ						
	Clerodendron phlomoides, *L*		2			Low, near Sakesar
	Lantana alba, *Mill.*	1	2	3	*káli búti, tút búti.*	Not uncommon all over from 1,000, to 3,500 Sakesar. Called *tút búti* from mulberry leaf smell of bruised leaves.
	Lippia nodiflora, *Rich* :		2	3	*mokná H. bokan H.*	Common all over low
	Verbena officinalis, *L.*		2	3		do, do,
	Vitex negundo, *L.*	1	2	3	*marwan, maura.*	Occasional all over low ("on top of Tilla only" Aitchison).
Labatiæ						
	Ajuga decumbens, *Thunb* :		2	3	*wadi-búti.*	Occasional all over to 4,500 Sakesar. Applied to head for lice.
	A. sp : (or variety of *A. d* ?)		2			Near Sakesar.
	Anisomeles ovata, *R. Br* :	1	2	3		Occasional all over, low.
	Ballota limbata, *Benth.*	1	2	3	*awáni-búti, awán.*	Common many places all over, to 3000 Tilla and Patiala. Juice of brused leaves applied to cattle's ophthalmia.

Colebrookia oppositifolia, *Sm* :	1		3	*phís bhekkar.*	At 2,000-3,000, on Tilla only.
Eremostachys Vicaryi, *Benth* :	1	2	3	*gorganna, kuráthrí, khalátrí, rewand-chíni.*	Common many places all over, at moderate heights. Seeds used as a cooling medicine.
E. sp : (or only a variety of *E. V* ?)		2	3		Occasional as last.
Lallemantia Roylcana, *Benth* :	1	2	3	*takht malangia, tukhm malanga*	Occasional all over to 3,000 Patiála (and 4,600 Shaikh Boodeen). Seeds are the *tukhm balangú* of native Materia Medica.
Lamium amplexicaule, *L.*		2	3		Occasional all over, low.
Leucas cephalotes, *Spr* :		2			Near Sakesar, low.
L. urticæfolia, *Benth* :	1	2			Occasional all over, low.
Marrubium vulgare, *L.*			3		At one place 2000, in centre. Doubtful if really wild.
Micromeria biflora, *Benth* :			3		At 3,700, Drengan only.
Nepeta ruderalis, *Ham* :	1	2	3		Occasional all over. to 3,000 Tilla.
N sp : *a*.			3		Occasional all over, above 2000, to 5000 Sakesar.
N. sp : *b*.			3		At various places, moderate heights.
Ocimum sanctum, *L.*	1		3		At 1,500 in east, apparently wild.
Origanum vulgare, *L.*		2	3		At 4-5000 Sakesar.
Phlomis pungens, *Willd* ?			3		In west at 2,500, (abundant on higher part of Shaikh Boodeen).
Plectranthus rugosus, *Benth* :	1	2	3		Common all over above 2000, to 4500 Sakesar.
Salvia Moorcroftiana, *Wall* :	1	2	3	*Karáthra, gúrgana, laphra, pápra.*	Common all over from 1500, to 5000 Sakesar. Peeled stems, sweetish, are eaten Root for cough of children, leaves applied to guinea-worm, seeds for vomiting.
S. plebeia, *R. Br.*	1		3		Occasional all over from low, to 3000 Tilla.
S. pumila, *Benth* :	1		3	*tak malanga.*	Not uncommon, to 2500 Diljabba. Browsed by sheep and goats. Seeds for diarrhæa. A pilose variety found elsewhere was not got on Range.

No.	Name of Plant	Collected by 1	2	3	Native Name	Remarks
	Scutellaria linearis, *Benth*			3	*mashara*	At 2000 to 3000 in west Bitter leaves are eaten as stomachic
	Stachys parviflora, *Benth*	1	2	3	*kumar, chitti bui, baggi b* *H l ti*	Common all over to 5000 Sakesar Bruised stems applied to guinea worm (*k r*)
	Dubia a			3	*tikht malanja*	Abundant 3 4000 Patiala and 4 4500 Sakesar Seeds medicinal
	Do b			3		At 5000 on Tilla
	Do c			3		At 1,500 one place in centre
	Plantaginaceæ					
	Plantago amplexicaulis *Cav*			3		Common all over at moderate heights
	P arenaria *W* and *Kit*			3	*isafghol*	Not common low
	P ciliata *Desf*			3	do	Not uncommon under 2000
	P decumbens, *Forsk*	1	2	3	do	Common all over at moderate heights
	P lanceolata *L*			3		Common at one place 2000
	P sp			3		At one place 2000 The seeds of several of these sp of Plantago used medicinally as *isafghol*
	Plumbaginaceæ					
	Plumbago Zeylanica *L*	1	2			Tilla and near Sakesar
	Salvadoraceæ					
	Salvadora oleoides *Dne*	1		3	*jal* fruit *pilu*	Occasional at low saline places in Range abundant along its base (Is very uncommon to north of the Range) S I lca from whose roots are made *miswāks* for cleaning the teeth does not appear to grow anywhere near to the south
	Phytolaccaceæ					
	Giesekia sp			3		Occasional low
	Salsolaceæ					
	Anabasis multiflora *Moq*	1		3	*lānā*	Common in many places low Used for washing cloth

Atriplex laciniata, *L.*	1		3	*surakka* H.	Occasional at 2,000
Caroxylon fœtidum, *Moq*:	1		3		Common many places, low.
C. Griffithii *Moq*:			3	*khír* (?)	Occasional, towards west.
Chenopodium album *L.*			3	*sharma* H. *báthū* H. *lūnuk* H.	Common all over, low.
C. murale, *L.*			3	*bátū*	Do, Do, used as a vegetable.
Halocharis sp:			3	*khār, kangan*, H	Occasional all over, to 3,000 Chiniot.
Panderia pilosa, *F. and M.*			3	*būi* H.	Common many places all over, low.
Sunæda fruticosa, *Moq*:			3		Common all over.
Dubia.			3		Occasional in west, low.
					Most of these Salsolaceæ only grow in saline places, and almost all are common along the base of the Range. There, after the rains several of them (especially Caroxylon) are collected and burned for the preparation of *sajji*, an impure Potash salt, used in washing.
Amarantaceæ.					
Achyranthes aspera *L*	1	2	3	*shikàrí, pūt kanda.*	Common all over, low. Ground seeds to children for bellyache.
Ærua Javanica, *L.*	1	2	3	*jāri*	Common all over, low
Æ. scandens, *Juss.*		2	3	*búi.*	Abundant many places all over at 1,500, to 2,500, Trihaddí
Celosia argentea, *L.*		2			In fields, near Sakesar.
Digera arvensis, *Forsk.*		2		*tandala.*	Do, Do,
Euxolus viridis, *Moq.*			3		Common in waste ground, low
Mengea tenuifolia, *Moq.*			3		Occasional, low
Pupalea lappacea *D.C.*	1		3	*lúdhra.*	Not uncommon all over, to 3,000 Tilla.
Nyctaginaceæ.					
Boerhaavia diffusa, *L.*	1	2	3	*itsit.*	Common all over, low.
B. repanda, *Wild.*	1	2			On Tilla, and near Sakesar.
Polygonaceæ.					
Polygonum aviculare *L.*			3		Common all over.
P. barbatum, *L.*	1	2	3	*narrí, H.*	Not uncommon, low, in wet. Name from *nal* a tube.

No.	Name of Plant.	Collected by 1	2	3	Native Name.	Remarks.
	P. Persicaria, *L.*	1		3		Not uncommon low; in wet Name from *nal* a tube.
	Rumex acutus *Rox:*	1		3		Common all over low, in west.
	R. vesicarius, *L.*	1	2	3	*khaṭṭītan, khaṭīmitha, gorgar* H.	Common lowish, all over. Leaves sweetish-sour (whence the name); eaten.
						Calligonum polygonoides, characteristic, of places to the south both Cis. and Trans-Indus, does not appear to occur up to the Range.
	Lauraceæ.					
	Tetranthera Roxburghii, *Nees.*	1		3	*medasak.*	A tree (planted?) at 3,000 and one or two wild at 2,500, Tilla. Bark is applied to bruises, in native medicine.
	Santalaceæ					
	Thesium sp:		2	3		At 3,600-5,000 Sakesar, common.
	Euphorbiaceæ					
	Adelia serrata.			3		Rare at 4,400, Sakesar.
	Andrachne telephioides, *L.*		2	3		Occasional all over from 2,000, to 5,000 Sakesar.
	Buxus sempervirens, *L.*	1	2	3	*pápri, pappar.* Wood *chikri* by carpenters of the plains, who make combs of it	Common many places centre and west only from 2,000 to 5,000 Sakesar It was found also in Wazíristán, and occurs locally in the Himalaya as far east as Mussoorie. Branches often used for thatching, wood not valued locally. Strongly odorous in flower. Leaves said to be rarely eaten by goats, poisonous to camels and other animals. Rarely seen above 8 inches girth, one trunk only of 16 inches.
	Crozophora tinctoria, *Juss:*			3		Occasional, low.
	Euphorbia Chamæsyce, *L*			3		Occasional all over, to 5,000 Sakesar.
	E. dracunculoides, *Lam.*			3		Not uncommon, low.
	E. Helioscopia, *L.*		2	3	*dúddar* H.	Do, Do,

E. hypericifolia, *L.*			3		Not uncommon, low.
E. Nepalensis, *Boiss.*		2	3		Abundant in fields, at moderate heights.
E. thymifolia, *L.*			3		Occasional, low.
E. sp :		2			Near Sakesar.
					Euphorbia Royleana not found wild in Range.
Fluggea virosa, *Dalz :*			3	*bíta, gargas, vanúthi.*	Occasional all over. 2,000-3000. Fruit eaten. Wood close grained, strong.
Leptopus cordifolia, *Dne*		2	3	*Sokiár,* H	On Chiniot 3,200, Sakesar 3,000-4,800.
Phyllanthus niruri, *L.*	1				On Tilla
P. urinaria, *L.*		2			Near Sakesar.
P. sp : ?		2			Do,
Ricinus communis, *L.*			3	*harnauli.*	Abundant apparently wild, at one place, 1,500. Animals die from eating leaves
Rottlera tinctoria *Rox.*	1		3	*kamela.*	On Tilla only, common at 2,000-3,000. Anthelmentic powder from off seed vessels
Amentaceæ.					
Quercus incana, *Rox.*		2	3	*vari.*	Common 4,500 5,000 Sakesar, to 5-8 feet high.
Salicaceæ.					
Salix Babylonica, *L.*		2	3	*bed, bet, katira.*	Occasional low, all over, generally planted. Wild at 2.500 Diljabba.
S. tetrasperma, *Rox :*			3	*bed.*	On island in Jhelum. Doubtful if found in Range.
Ulmaceæ.					
Celtis Caucasia, *Willd.*	1	2	3	*battaman. wattaman. batkar.*	Occasional all over from 1,500, to 4,000 Sakesar. *Bat* or *wat* means "wild"?
Sponia Wightii, Planch.			3		At 1,500, one place in centre
Ulmus erosa ?			3		Not uncommon in ravine at 3-3,500, Sakesar.
Urticaceæ.					
Cannabis sativa, *L.*		2	3		Not uncommon all over, low, in waste places.
Ficus caricoides, *Rox.*		2	3	*phagwára, khabáre.*	Not uncommon all over from 1,500, to 5,000 Sakesar. Fruit said not to be good here, but is very good in parts of Himalaya.
F. glomerata, *Willd.*			3		On island in Jhelum. Doutful if wild in Range

N. O.	Name of plants.	Collected by 1	2	3	Native Name.	Frequency, height above the sea in feet at which found, uses &c,
	F. Indica, *Rox:*	1		3	*bor, bar.*	Not uncommon wild from 2,000, to 3,000 Tilla and Diljabba Frequent planted, the largest tree seen being 25 feet girth. F. religiosa found wild no where in Range.
	F. infectoria, *Willd.*	1	2	3	*bat-bar, palak, palkhi, war ;*	Occasional all over 2,000 to 3,000 Tilla. Chiniot and Sakesar.
	Forskählea tenacissima, *L*	1	2	3	*harúti búti.*	Occasional all over from 1,500, to 2,800 Tilla.
	Nussiessya hypoleaca, *Wedd.*			3		On island in Jhelum, and at 1,500 in centre, at one place only. Morus nowhere wild Pinus do: do: In the arid western hills the lower limit of P. longifolia rises; in Wazíristán it is not under 8,000 feet
Gnetaceæ.						
	Ephedra alata.		2	3	*kúchan, nikki kurkín, bratta* H, *tandala,* H *lastúk,* H.	Only in west, from 1,200, to 3,000 Sakesar. Used for scrubbing dishes.
Palmæ.						
	Chamærops Ritchiana, *Griff.*	1		3	*patha, kilú, ahún.*	Abundant at places in centre and west (not found to east of Pail) from 2,000, to 5,000 Sakesar generally much cut up. Is still more common Trans-Indus and eastern Affghanistan. Mats made of the fine narrow leaves, and well-ropes and bed-string from large coarser do. For mooring-ropes much less strong than *múnj.* A stray specimen found by Dr. Aitchison, probably brought down by river from a Himalayan habitat like that noted in the text. Curious enough, large plants in Saharunpore Botanic garden said to be grown

					from Trans Indus seed differ *very* much from the wild plant
Phœnix sylvestris, *Rox*	1		3	*khajúr*	Occasional at 2 000 all over On Tilla abundant to 2 500, rare over that. Fruit said not to ripen well Fruit stalks used for polishing wood(?)
Butomaceæ					
Butomus umbellatus *L*		2			Very rare near Sakesar at 2 000 Alisma Plantago grows in plains near Peshawur is the specimen found by Dr Aitchison at Jhelum may have been in its normal position
Juncaceæ					
Juncus bufonius, *L*	1				Tilla
J sp ?		2		*dila*, H	Near Sakesar *Dila* is a common Punjabi name for sedges and sedge like plants
Commelynaceæ					
Commelyna Bengalensis *L*		2	3		Tilla and near Sakesar
C communis *L*		2	3		do, do,
Orchidaceæ					
Zeuxine sulcata, *Lindl*			3		(On island in Jhelum and) one place in east at 1,500 abundant
Typhaceæ					
Typha angustifolia, *L*		2	3	*kundar (?)*	Not uncommon at places all over at 1,500 2 000 in water Leaves used for roofs In parts of the Punjab the mucilaginous lower part of the leaf is used to clear water
Melanthaceæ					
Colchicum sp ?		2	3	*isafghol, baphor*	Common at several places about 2,000 Seeds medicinal (?)
Iridaceæ					
Iris sp			3		At one place 2 000, and at 3,000 Sakesar
Hydrocharidaceæ					
Hydrilla verticillata		2	3		Occasional about 2,2 0

N. O.	Name of plant.	Collected by			Native Name	Frequency, height above the sea in feet at which found, uses &c.
		1	2	3		
Fluviales						
	Potamogeton crispus, *L.*	1		3		Occasional, low.
	P. gramineus, *L.*		2			Do,
	P. natans, *L.*		2			Do,
	P. perfoliatus, *L.*		2	3		At about 2,000.
	Vallisneria spiralis.		2	3		Occasional, low.
	Zannichellia palustris, *L.*		2			Near Sakesar
Liliaceæ.						
	Allium sativum, *L* ?			3	*gutta, Janglī piyáz. pad-wassal*	In several places in west from 2,500, to 4,500 Sakesar. Names are from those for onion, and the arabic *basl* for do:
	A. rubellum, *Bieb:*	1	2	3	*gad vassal, jangli* or *baráni, piyáz.*	Abundant all over, low, preferring dry shingly places. Roots are eaten.
	A. sp: ?		2		*biphor,* H.	Near Sakesár.
	A. racemosus. *Willd:*	1	2	3	*pūt kundr, vinjanhora jari kandiáli*	Occasional at 3,000, Tilla, Patiála and Sakesar. Root as a cattle-medicine.
	Asparagus sp: *(of Punjáb)*	1	2	3	*churi saroch, kúchan, banatha*	Not uncommon all over and to 5,000 Sakesar. Young shoots eaten as a vegetable; old plant used for cleaning dishes. Root furnishes medicinal *sitáwar* ?
	Asphodelus fistulosus, *L.*		2	3	*bokát,* H.	Not uncommon in fields all over, low.
	Gagea lutea.		2	3		Occasional all over, 2,000 to 3,000 Tilla (and to 4,500, Shaikh Boodeen.)
	Ophiopogon sp: ?			3		Common in one shady place at 4,700 Sakesar.
	Scilla sp:	1				Rare, one place at 2,000, in east.
	Tulipa stellata, *Hook:*		2	3	*bhúmphor, chabúna, paduna, jalkukar*	Common at places all over, to 2,000 (to 4,600, Shaik Boodeen) Roots frequently eaten.
	Uropetalum sp: ?		2	3	*phaphor, kachwassl,* H.	Rare, low in centre and west.
						Aloe perfoliata rare, only cultivated. Peeled leaves eaten, and also applied to boils.

Araceæ					
Typhonium sp	1				At 3 000 Tilla only
Gramineæ					
Andropogon annulatus, *Forsk*	1	2	3	*inmyar*	Occasional all over at moderate heights
A involutus, *Stend*			3		Low in west
Anthistiria anathera, *Nees*	1	2	3		Occasional all over
Apluda aristata, *Rox*	1	2	3		Not uncommon all over, to 5 000 Sakesar ?
Aristida depressa, *Retz.*	1	2	3		At moderate heights
A murina, *Cav*	1	2	3		Occasional at 2,000 2,500
A sp		2			Near Sakesar
Arundinella sp ?			3		At 3 000 Tilla
Arundo Donax, *L*	1	2	3	*nar*	Not uncommon low Useful for fences, trellises &c Name from *nal* a tube
A sp ?		2			Near Sakesar
Avena fatua, *L*	1		3		Not uncommon, in wheat fields, low
Bambusa stricta, *Rox*	1		3	*bans*	At several places (on and near Tilla, and on Diljabba) in east only at 2,500 3,000. Used for baskets and other purposes
Batratherum molle, *Nees*	1		3		Occasional all over about 2 000
Bromus arvensis, *L*		2	3		Common places all over to 2,200
Cenchrus sp		2			Near Sakesar
Chloris villosa *Pers*			3		Occasional low, chiefly to west
Chrysopogon serrulatus *Trin.*	1	2	3	*dhamman*, H	Occasional low all over
Cymbopogon laniger, *Desf*	1		3	*san*	All over 1 500, to 3 000 in west
Cynodon dactylon *L*	1	2	3	*khabbal*	Common low all over
Dactyloctenium Ægyptiacum, *Willd*	1		3		Occasional low
Digitaria sanguinalis *Pers.*	1	2	3		At 1 500 2 000 all over
Eleusine flagellifera, *Nees*			3		Not uncommon, chiefly in west
E sp.		2		*kurmadan*, H	Near Sakesar
Eragrostis cynosuroides, *R and S*	1		3	*dab*, H *dab* H	Occasional low all over
E poaoides, *B uv*	1	2	3		Occasional to 2 500
E sp *a*			3		Occasional to 2 500
E sp : *b*			3		do, low
Heteropogon contortus, *R and S*	1	2	3		do do

No.	Name of Plant.	Collected by 1	2	3	Native Name.	Remarks.
	Kæhleria phlæoides, *Pers.*			3		Occasional low.
	Lappago biflora, *Rox*	1				do, do
	Lolium temulentum, *L.*			3		Not uncommon low, more frequent to west.
	Melanocenchrus Royleana, *Nees.*	1				In east.
	Nardus stricta ?			3		Several places about 1,800, common (to 4,500 Shaik Boodeen).
	Panicum antidotale, *Retz*	1	2	3	*girwi*, H.	All over, not uncommon.
	P. maximum, *Jacq.*			3		Occasional low.
	P. Petiverii, *Trin.*	1	2			
	P. sp : *a.*		2			
	P. sp : *b.*		2			
	P. sp : *c.*		2			
	Pappophorum sp.		2	3		Occasional low.
	Pennisetum araneosum, *Edgew.*		2	3	*dhaman*, H.	Occasional to 3,000 Patiala (and 4,600 Shaikh Boodeen)
	P. cenchroides, *Rich.*	1	2	3		Common on low ridges (to 4,600 Shaikh Boodeen).
	P. sp :			3		At 4,500 Sakesar.
	Poa annua, *L.* ?		2	3		Occasional at 2,000.
	P. sp :			3		Low.
	Polypogon Monspeliensis, *L.*			3		At wet, low.
	Rottbœllia hirsuta, *Vahl.*			3		Common extreme west only.
	Saccharum munja, *Rox.*	1	2	3	*sarút, múnj.*	Low. Much used for ropes.
	S. spontaneum, *L.*	1	2			Do,
	S. violaceum ?		2			Do,
	S. sp :		2			Do,
	Setaria glauca, *Beauv.*		2		*dissi*, H.	
	Sorghum Halepense, *Pers :*		2		*barwa*, H.	
	Stipagrostis plumosus,			3		Common low, in extreme west
	Dubia, *a.*			3		In extreme west, only.

Dubia, *b.*					Rare at 2,000.
" *c.*					
					Anatherum muricatum not met with in Range. It seems doubtful if it is "cultivated" (Aitchison) any where near this, tho' not unlikely to be wild.
Cyperaceæ					
Cyperus exaltatus, *Retz.*		2	3		Occasional at moderate heights.
C. Haspan *L.*		2			
C. mucronatus, *Rottb.*	1	2	3		Low.
C. niveus, *Retz.*		2	3		Common in many very dry places, 2,5000, to 5,000 Sakesar.
C. rotundus, *L.*		2			
C. sp : *a.*		2			
C. sp : *b.*		2			
C sp : *c.*		2		*mūrak, chamūna*	
Elæocharis palustris, *R. Br.*			3		At moderate heights.
Eriophorum comosum, *Wall*	1		3	*babūr.*	At 1,500-2,500 on Tilla. Rare in west. For making bed-string &c.
Malacochæte pectinata, *Nees.*		2			
Scirpus maritimus, *L.*		2	3	*mārak.*	Low.
Dubia *a.*		2			
" *b.*		2			
" *c.*		2			
Filices.					
Adiantum capillus Veneris, *L.*	1	2	3	*parsha-warsha.*	Occasional at moist places all over to 2,500. With pepper as a febrifuge. Name evidently a corruption of Persian *pari seoshān.* "fairy's hair."
A. caudatum, *L.*	1	2	3		Not uncommon all over on dry rocks at 2-3,000.
Asplenium Dalhousiæ, *Hook:*	1				On Tilla, (grows on driest rocks also).
Cheilanthes farinosa, *Kaulf:*	1		3		At 25-2,000 Tilla (as last).
Cystopteris sp : ?		2			Near Sakesar.
Ophioglossum vulgatum, *L.* ?			3		Abundant at two places, towards east, on dry shingly slopes about 2000.

N. O.	Native of Plant.	Collected by 1	2	3	Native Name.	REMARKS.
	Pteris longifolia, *L.*			3	....	At a moist place, 1,500, in centre.
	Equisetaceæ.					
	Equisetum debile, *Rox*		2	3	*Nári,*	Occasional, low. Stems used in medicine. Name from *nál* a tube.
	Characeæ.					
	Chara. (and half a dozen other Cryptogams.)		2	3	....	Occasional at moderate heights
	Dubia.,					
	Leguminosæ or Convolvulaceæ.			3	....	At 2,000, one place.

Statistics.

The following is an abstract of some of the statistical details of the above list.

Collected by Dr. Aitchison,	182	Collected by Dr. A. *only*,	22
Do. Dr. Henderson,	299	Do. Dr. H. *only*,	74
Do. Dr. Stewart,	431	Do Dr. S. *only*,	162

Common to two of these.—

Drs. Aitchison and Henderson,	...	12	
Drs. Aitchison and Stewart,	..	56	
Drs. Henderson and Stewart,	...	121	
			189
Common to all three,	...		93
Total,	...		540

These 540 species are distributed among about 367 genera and 94 natural orders.

Elevation of habitats &c.

As very few of the places visited by myself are under 2,000 feet above the sea, and of the plants of the other two collectors, only those of the Salt Range have been included in the list, few or none of the whole of those in the latter are restricted to under 2,000 feet. But a very considerable proportion of the whole grow down to the general plains-level, especially to the north and north-west of the Range. In certain cases some particulars have been added as to habitats on Shaikh Boodeen, or in other localities Trans-Indus or in the Himalaya,

Uses of plants.

and in one or two instances besides the purposes to which plants may be applied in the Salt Range, the uses have been inserted to which certain plants are put elsewhere.

Plants doubtfully wild in the Range.

It is more or less doubtful if the following species are found truly wild anywhere in the Range.

Vitis vinifera.
Zizyphus Jujuba.
Cordia vestita.
Cordia latifolia.

Hyperanthera pterygosperma.
Acacia Arabica.
Dalbergia sissoo.
Sizygium Jambolanum.
Luffa amara.
Mussœnda sp.
Buddleia Neemda.
Datura Stramonium.
Marrubium vulgare.
Salix tetrasperma.
Ficus glomerata.

Species doubtful.

Besides the plants marked in the list as evidently Dubiœ, the following are the chief of those of which the *species* is doubtful.

Polygala oligophylla.
Indigofera Gerardiana.
Zizyphus sp.
Convolvulus saxatilis.
Solanum dulcamara.
Ajuga sp:
Eremostachys sp:
Phlomis pungens.
Ulmus erosa.
Allium sativum.
Bambusa stricta.
Poa annua.
Saccharum violaceum.
Cyperus Haspan.
Ophioglossum vulgatum.

Genera doubtful

The *genera* of the following require identification.

Arabis.
Colchicum.
Allium.
Ophiopogon.
Scilla.
Uropetalum.
Nardus.
Cystopteris.

Identity doubtful.

And the identity of the following plants is in considerable doubt from their not being found in a satisfactory state for diagnosis.

Sageretia oppositifolia.
Spondias mangifera.
Eryngium dichotomum.
Silybum Marianum.
Orthanthera viminea.

Peculiarities of isolated Floras

In a paper read by Dr. Hooker to the British Association in 1866, on "Insular Floras" he mentioned the following as some of the chief peculiarities generally observed in the vegetation of Oceanic islands.

1. The number of species are few in proportion to that of

genera, and the latter few in proportion to natural orders.
2. The mountains however lofty, present but few of the plants generally found growing at similar heights in continents.
3. The total number of species is usually smaller than would be found in a continental area of equal size and conditions.
4. And there are usually notable connections and affinities with the plants of each other or of certain continents.

The remarks and lists which follow will indicate that each of these peculiarities except the 3rd is to some extent exemplified by the Flora of the Salt Range which in some sort is isolated like the Floras of islands.

Proportion of Nat: orders.

The relation of Natural Orders to genera and species here, as compared with certain other somewhat analogous Floras is shown by the following:—

	Natural orders.	Genera	Species.
Aden, ...	1	1·92	2·29
Moultan, ...	1	3·4	5·
Peshawur, ...	1	3·45	4·91
Salt Range, ...	1	4·	5·9

Flora of East and West.

Dr. Aitchison has remarked that the Flora of the eastern part of the Range which was botanized by him, constitutes a link between that of Kashmir (North-West Himalayan), and that of the Moultan tract, botanized by Edgeworth. In the Flora of the Salt Range generally we find connections still more interesting with that of the Trans-Indus and Affghanistan. And my route from east to west was the best calculated to bring out these prominently, as in advancing towards the west I *gradually* came to a good many members of the Affghan Flora, most of them old Frontier friends of mine. The time at which I made my trip was perhaps rather too late for some of the Caryophyllaceæ, Cruciferæ (mostly western) and other early flowering natural Orders, while for some of those of the later flowering orders such as Cucurbitaceæ and Convolvulaceæ (mostly eastern)—I have for the most part had to depend on my fellow-observers.

Possible errors.

In the following lists as to distribution which are at the best only tentative, I have endeavoured as far as possible to avoid inserting without noting the doubt, those numerous plants whose identity is dubious, as well as those regarding the range of which I have not tolerably certain information. But doubtless a proportion of errors of both kinds have crept in, and for these I need hardly apologize to those who know under what difficulties one works in the distant Indian Mofussil.

Plants of restricted range.

I may mention the following limits of some of the more notable plants whose distribution in the Salt Range is most restricted (exclusive of a few which have only been found on and about Tilla.) The Bamboo has been got only on and near Tilla, and on Diljabba in the east. Buxus from Chiniot in the centre to near the extreme west, Chamærops from Páil in the centre to near the extreme west, Reptonia only on and near the base of Sakesar, and Flacourtia sepiaria in the same part but over a still more limited area.

Salt Range plants from the South East

A. The chief plants which have been found in the Moultan tract and other parts to the south of the Salt Range as well as in the latter, but which do not appear to exist or are extremely rare to the north and north-west of the Range are these:—

Farsetia Jacquemonti
Flacourtia sepiaria
Grewia villosa.
Acacia arabica (cult.)
A. eburnea.
Butea frondosa.
Prosopis spicigera
Psoralea plicata.
Tephrosia purpurea.
Carissa diffusa
Ceropegia esculenta.
Leptadenia Jacquemontii.
Oxystelma esculenta.
Lycium Europæum (in Affghanistan ?)
Solanum gracilipes.
Striga euphrasioides.
Phelipæa Calotropidis.

Microlonchus divaricatus.

Ephedra alata (in Indus valley ?)

South East plants not in the Range.

B. The following are a few of the principal plants found to the south and south-east of the Salt Range, but which have not yet been observed, or are very rare in, or to the north of, the latter.

Cocculus villosus.
Argemone Mexicana.
Acacia Jacquemontiana (occasional towards Peshawur ?]
A. leucophlœa.
Neurada procumbens
Boucerosia edulis.
Hyoscyamus pusillus.
Cordia oppositifolia (culti
Salvadora Indica.
Calligonum polygonoides.

Salt Range plants from the West.

C. A large proportion of the Salt Range plants belong to the Western or Affghan Flora as they occur, many of them in the plains, to the north-west, west, and south-west of the Range. The more notable of these which appear to have not yet been found in the plains to the south or south-east, or in the Himalaya, Cis-Indus, (except in a few instances in the extreme north-west corner) a considerable proportion of which occur chiefly or only in the western parts of the Salt Range are as follows :—

Delphinium saniculœfolium.
Hypecoum procumbeus.
Papaver cornigerum.
Brassica sp :
Goldbachia lævigata
Malcolmia strigosa.
Physorhynchus Brahnicus.
Sisymbrium Sophia.
Cleome linearis.
Viola cinerea.
Dianthus sp :
Silene Leysseroides.
Hibiscus Gibsoni.
Dodonœa Burmanniana.
Erodium Cicutarium.
Picridium Tingitanum
Scorzonera sp :
Compositæ Dubia *d.*
,, ,, ,, *e.*
Reptonia buxifolia.
Rhazya stricta.
Boucerosia Aucheri.
Periploca aphylla.
Convolvulus saxatilis.
Anchusa hispida.
Bothriospermum tenellum.
Nonnæa pulla.
Withania coagulans.
Ballota limbata.
Lamium amplexicaule.

Erodium maritimum.
Geranium lucidum.
G. rotundifolium.
Rhamnus Persica.
Sageretia Brandrethiana.
Astragalus multiceps.
A. tribuloides
A. sp : *d.*
Cassia obovata.
Lespedeza sp :
Taverniera nummularifolia.
Pimpinella crinita.
Scabiosa Olivieri.
Cousinia calcitrapæformis.
Phlomis pungens.
Plantago arenaria.
P. ciliata.
P. decumbens.
Rumex vesicarius.
Flüggea virosa.
Forskählea tenacissima.
Chamærops Ritchiana.
Allium sativum.
Pappophorum sp :
Rottbœllia hirsuta.
Stipagrostis plumosa.

Salt Range plants from the Himalaya.

D. The following are the chief of a considerable number of plants of the Himalaya and Siwâliks which also grow in the Salt Range but which so far as I know have not yet been found or are exceedingly rare to the north-west of the Range, or Trans-Indus:—

Flacourtia sapida.
Viola serpens.
Hibiscus vitifolius.
Sterculia villosa.
Bombax heptaphyllum.
Kydia calycina.
Grewia elastica.
Hypericum speciosum.
Vitis carnosa.
Ceanothus flavescens.
Sageretia oppositifolia (?)
Odina Wodier.
Spondias Mangifera (?)
Acacia speciosa.
Bauhinia variegata.
Indigofera arborea.
Lespedeza cuneata.
Mimosa rubicaulis.
Tephrosia tenuis.
Vigna carinalis.
Mussænda. sp :
Inula oblonga.
Jasminum grandiflorum.
Marsdenia Royleana.
Cordia vestita (?)
Clerodendron phlomoides.
Origanum vulgare.
Plumbago Zeylanica.
Tetranthera Roxburghii.
Thesium sp : (?)
Adelia serrata.
Leptopus cordifolius.
Rottlera tinctoria.
Quercus incana.
Sponia Wightii.
Ulmus erosa.
Nussiessya hypoleuca.
Asparagus racemosus.
Bambusa stricta.
Adiantum caudatum.

Hedera Helix.
Hamiltonia suaveolens.

Asplenium Dalhousiæ.
Cheilanthes farinosa.

Salt Range plants from the West and the Himalaya.

E. The following plants found in the Salt Range occur also to the north west or Trans-Indus, frequently in the plains, as well as in the Himalaya or Siwáliks, but have not been observed or are extremely rare in the plains to the south or south-east of the Range :—

Clematis grata.
C. orientalis.
Capparis spinosa.
Hibiscus Trionum.
Grewia oppositifolia.
Gymnosporia spinosa.
Pistacia integerrima.
Rhus Cotinus.
Dalbergia sissoo.
Indigofera Gerardiana.
Trigonella incisa.
Cotoneaster obtusa
Grislea tomentosa.
Punica granatum.
Herniaria hirsuta.
Eryngium dichotomum (?)
Galium aparine.
Gardenia tetrasperma.
Morina Wallichiana.
Scabiosa succisa.
Aplotaxis candicans.
Serratula pallida.
Silybum Marianum (?).
Taraxacum officinale.

Campanula canescens.
Androsace rotundifolia.
Myrsine Africana.
Olea Europæa.
Jasminum revolutum.
Amphicome Emodi.
Lithospermum arvense.
Onosma echioides.
Solanum dulcamara (?)
Leptorhabdos parviflora.
Colebrookia oppositifolia.
Marrubium vulgare.
Micromeria biflora.
Plectranthus rugosus.
Salvia Moorcroftiana
Scutellaria linearis.
Buxus sempervirens.
Celtis Caucasica.
Allium rubellum.
Gagea lutea.
Tulipa stellata.
Adiantum Capillus Veneris.
Pteris longifolia.

Western plants not in the Range.

F. A good many plants which occur Trans-Indus or to the north-west of the Salt Range, often at the plains-level, have not yet been found in the Range (or to the south-east of it.) The chief of these are as follows :—

Adonis autumnalis.

Nonnæa Edgeworthii

Ceratocephalus falcatus.
Alyssum calycinum.
Chorispora sp :
Euclidium Syriacum.
Lepidium ruderale.
Leptaleum filiforme
Notoceras sp .
Cleome droserifolia.
Frankenia pulverulenta.
Haplophyllum sp :
Rubus fruticosus (? Himalaya ?)
Tillæa muscosa.
Cometes sp .
Bunium sp .
Psammogeton biternatum.
Asperula cynanchica
Valerianella sp .
Barkhausia sp .
Calendula officinalis
Inula graveolens.
Koelpinia linearis.
Matricaria disciformis.
M. præcox.
Phænopus vimineus.
Arnebia echioides.
Lycopsis arvensis
Rocholia stellulata.
Scopolia præalta. ?
Linaria Cabulica.
Scrophularia Cabulica.
Eremostachys laciniata. (Siwaliks ?)
Lycopus Europœus.
Mentha incana, (Himalaya ?)
Plantago sp :
Blitum virgatum.
Chenopodium Botrys. (Himalaya.)
Salsola Kali.
Quercus Ilex (Himalaya).
Populus alba (Himalaya).
P. Euphratica (and to South.)
Celtis Nepalensis (Himalaya).
Pouzolzia ciliaris.
Butomus umbellatus.
Alisma reniforme.
Œgilops sp :
Agrostis alba.
Dactylis glomerata.
Kœhleria phleoides.
Lamarckia aurea.
Pennisetum dichotonca.
Sporobolus sp .

Vegetation of Tilla and the East.

Dr. Aitchison's remarks would lead as I conceive to the belief in a greater distinction between the vegetation of Tilla and that of the other hills and ridges than really exists. But there *are* doubtless a considerable number of plants found upon Tilla which are not found or are very rare on the hills to the west of it at similar heights. This depends to some extent on the mass of Tilla being greater than that of Diljabba, Drengan &c. so that the former is more favourable to vegetation. But its more extensive Flora arises chiefly from the fact that it lies nearer to the Siwaliks and Himalaya where there is greater rain fall and a larger Flora, many of the members of which extend to and are perpetuated on Tilla. Generally speaking also and for the latter reason the eastern part of the Range has a larger number of species as well as of individuals than that towards the west.

Himalayan species

It is notable that certain plants, such as Gymnosporia reach a greater elevation on Sakesar than elsewhere. On Sakesar also there are a larger number of Himalayan plants than at similar elevations on other hills of the Range of less height. But on the whole the number of Himalayan species which occur even upon Sakesar is very much smaller than would be found at similar elevations in the Himalaya themselves, nor is their place supplied by any adequate admixture of western plants.

No difference on different strata.

As regards difference of vegetation according to the geological formation, I was able to detect no persistent relations between these in the Salt Range, except as to the saliferous strata, where the vegetation is generally peculiar. In saline (*kallar*) soil also, here as elsewhere, a few characteristic plants as Tamarisk and Salsolaceæ generally prevail, while many others, common in other places, are rare or absent in the former. I have already noted that I saw no reason to believe that Grisla affects the northern sandstone ridges exclusively as Dr. Fleming supposed.

Characteristic Punjáb plants.

For a provincial collection.

The Salt Range Flora includes a very considerable number of the more peculiar or characteristic plants of the Punjáb. It is an object of some interest that there should be at Lahore a good collection of live specimens of these, whether indeed they are of economical value or not, but as yet much less has been done in this way than could be wished for. The following is a list of the more notable of such characteristic plants, large and small, contained in the Salt Range list, as seem most worthy of introduction into such a provincial collection. Most of these might be expected to do fairly well at Lahore where the greater number of them have not as yet been cultivated:—

Delphinium Saniculæfolium.
Cocculus Leæba.
Papaver cornigerum.
Brassica sp : (lilac).
Goldbachia lævigata.
Malcolmia strigosa.
Physorhynchus Brahuicus.
Capparis spinosa.
Cleome linearis.
C. Ruta.
Flacourtia sapida.
Viola cinerea.
Silene Loysseroides.
Hibiscus Gibsoni.
Grewia betulæfolia.
Gymnosporia spinosa.
Rhamnus Persica.
Sageretia Brandrethiana.
Pistacia integerrima.
Acacia eburnea.
Astragalus multiceps.
A. tribuloides.
Cassia obovata.
Crotalaria Burhia.
Edwardsia Hydaspica.
Lespedeza sp :
Mimosa rubicaulis.
Psoralea corylifolia.
P. plicata.
Taverniera nummularifolia.
Tephrosia purpurea.
Vigna carinalis.
Cucumis Colocynthis.
Eryngium dichotomum.
Scabiosa Olivierei
Carthamus oxyacantha.
Cousinia Calcitrapæformis.
Echinops echinatus.

Picridium Tingitanum.
Pluchea sp : (2.)
Scorzonera sp :
Reptonia buxifolia.
Rhazya stricta.
Boucerosia Aucheri.
Ceropegia esculenta.
Leptadenia Jacquemonti
Orthanthera viminea.
Oxystelma esculenta.
Periploca aphylla
Amphicome Emodi.
Tecoma undulata.
Convolvulus saxatilis.
Buddleia Neemda.
Anchusa hispida.
Cordia vestita.
Nonnæa pulla.
Solanum gracilipes.
S. sanctum.
Withania coagulans.
Linaria sp : (various).
Scrophularia scabiosæfolia.
Phelipæa Calotropidis.
Dipteracanthus prostrata.
Lantana alba.
Ballota limbata.
Eremostachys Vicaryi.
Lallemantia Royleana.
Marrubium vulgare.
Phlomis pungens.
Salvia Moorcroftiana.
Stachys parviflora.
Plantago ciliata &c.
Caroxylon sp :
Boerhaavia repanda.
Rumex vesicarius.
Flüggea virosa.

Iris sp :
Allium rubellum.
Asparagus sp : (of Punjab).
Scilla sp :
Tulipa stellata.
Uropetalum sp :

and several of the characteristic grasses and of the commoner ferns.

With some prospect of getting a Punjab Botanic Garden or of having the Agri-Horticultural Society put upon a proper footing, we may perhaps look forward ere long to seeing at the capital of the Punjab a collection of live plants characteristic of the Flora of the Province, including most of these, with numerous others which do not occur in the Salt Range.

In conclusion and as an apology for at least part of such errors and defects as may be found in this paper, I may mention that it has been written in the intervals of pressing official work and amid much wandering to and fro upon the face of the earth.

Finis.

I —*The cultivation of Orchids, adapted to the climate of Calcutta.* By SAMUEL JENNINGS, *F. R. H. S.*

(Continued from p. 260 of Vol XIV. old series.)

Ferdinandiza.

A slender stemmed Orchid of Tropical America flowers are small and yellow. It is also called " Lockhartia."

Forficaria graminifolia.

Terrestrial—Leaves narrow rigid grassy, flowers in loose racemes of 8 or 10 blossoms Native of Cape Colony.

Galeandra.

A beautiful Terrestrial Orchid so called from the likeness of the flower to a " helmet." It is deciduous, and upright in its growth, should be cultivated in a compost of peat heath soil, charcoal, and cocoafibre; requires good drainage and high temperature in summer, cool and dry in winter.

Galeandra is now considered united to Eulophia.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Gal : Bauerii, ..	Guayana, ..	pink and purple.	
	„ Devoniana,	S. America, ..	pink and white.	
	„ extinctoria,	Siera Leone,		
	„ gracilis, ..			

Galeottia.

An obscure Mexican Orchid, near "Batemanii."

Gamoplexis orobanchoides.

A tuber rooted terrestrial Orchid of the north-west of India, flowers, straw colour.

Gastrodia.

A Terrestrial Orchid the whole plant, leaves flowers &c., is of a uniform pale brown colour.

1. Gas : Cunninghamii, New Zealand.
2. „ Sesamoides, Australia.

Geodorum.

A terrestrial Orchid, roots tuberous, leaves lance shaped, deciduous, flowers not very striking.

No.	Name.	Country.	Colour of flowers.	REMARKS.
*†1	Geo : candidum,	Moulmein.		
	citrinum, ..	Chittagong.		
3	„ dilatatum, ..	Sylhet.		
4	„ pallidum, ..	do.		
5	„ pictum, ..	New Holland		
6	„ purpureum,	East Indies.		

Georchis.

Terrestrial, not unlike Anœctochilus and should be grown in the same way.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Geo : biflora, ..	Nepaul.		
2	„ cordata, ..	Ceylon.		
3	„ foliosa, ..	Burmah.		

Glomeria.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Glom : Blumei,	Khassia Hills,	white.	
2	„ erythrosma,	Java.		

Glossodia.

An Australian Orchid, terrestrial, near Caladenia, flowers blue.

Gongora.

Grow in baskets with moss,

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Gon. atropurpurea	Trinidad, ..	deep claret.	
2	„ bufonia, .	... ..	pink.	
3	„ maculata, ..	Guatemala,	yellow and red.	
4	„ do. tricolor,	„	clear yellow-brown and white.	
5	„ nigrita, ..	..	claret.	
6	„ quinquinervis,	Peru, .	purple.	
7	„ speciosa, .			
8	„ truncata, ..	Guatemala,	yellow and white.	

Goodyera.

Terrestrial, evergreen, dark foliage, flowers are small; should be grown in a pot with peat and leaf mould.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Goodyera discolor,	Brazil,	white and yellow.	
2	„ elongata,	Guayana.		
3	„ Guayanense,...	„		
4	„ macrophylla,	Madeira.		
	marginata, ..	West Indies.		
6	„ nuba,	Mauritius,		
7	„ procera,	Nepal, Ceylon and Java		
8	„ rubicunda,	Manilla		

Govenia.

A terrestrial orchid of South America; flowers white cream or yellow, small and unattractive

Grammatophyllum.

A handsome terrestrial orchid having thick stems; grow in a pot with a mixture of jammah and heath soil, moisture and shade are requisite, but care must be taken in watering as this plant is very liable to rot.

No.	Name	Country.	Colour of flowers.	REMARKS.
1	Gra[illegible] Finlaysonianum,	Singapore		
2	„ multiflorum,	Malay Archipelago	green and purple	
† 3	„ scriptum, ..	Java.		
†4	„ speciosum, ..	Java,	lemon colour.	
5	„ tigrinum,			

Grobya.

Gro: Amherstiœ and Gro: galeata—Brazilian, flowers yellow and purple.

Gunnia Australis.

A Tasmanian epiphytal Orchid having small fragrant yellow and lilac flowers.

Habenaria.

A large genus, Terrestrial, flowers generally fragrant. Natives of Europe Asia and Africa.

No.	Name.	Country.	Colour of flowers,	REMARKS.
1	Hab · bifolia,	England,	commonly called the small Butterfly Orchis.	
2	„ chlorantha,	do.	commonly called the large Butterfly Orchis.	
3	„ longicalcarata			

Hæmaria discolor.

A small Chinese terrestrial orchid very near "*Goodyera.*"

* † *Hartwegia purpurea.*

A pretty dwarf orchid with single leaves variegated with lighter green marks, flowers bright pink. It is a native of Guatemala and Mexico.

Helcia sanguinolenta.

A terrestrial orchid; bearing flowers white crimson and yellow, native of Peru.

Herminium.

A temperate terrestrial orchid; flowers generally small and insignificant.

1 Herm: Monorchis, (the musk orchis).

Herschellia cœlestis.

A terrestrial orchid of South Africa; flowers sky blue.

Hexadesmia.

An epiphytal orchid of Central America, flowers green and white near "*Epidendrum.*"

Hoffmeisterella eumicroscopica.

A very minute plant a native of Peru closely related to "*Vanda,*" flowers yellow.

Houlletia.

This Orchid thrives best in a pot filled with reduced sphagnum moss, turfy heath soil, and broken potsherds, when growing it requires abundant water, none at all when torpid.

It is terrestrial and bears one long membranaceous leaf, it flowers from the base of the bulbs.

No.	Name.	Country.	Colour of flowers.	REMARKS.
+ 1	Houl: Brocklehurstiana, ..	Corcovada, ..	purple brown and yellow, fragrant.	
2	„ odoratissima,	Brazil, ..	brick red and white.	
3	„ tigrina, ..	New Granada	yellow and crimson.	
4	„ vittata, ..	Brazil, .	brown and yellow.	

Huntleya.

A small evergreen Orchid with flowers of great beauty, it should be grown in a pot filled with peat thoroughly drained and placed in a shaded position. It requires copious watering and ought to be repotted annually.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Huntleya cerina,	C. America,	pale yellow and purple.	
2	„ meleagris, ..	S. America,	yellow and claret.	
3	„ violacea, ..	Guayana, .	deep violet.	
4	„ Wailesia, .	.. ..	white and purple.	

Hyacinthorchis variabilis.

A Japanese terrestrial orchid; flowers pink.

Hylophila mollis.

A Singapore orchid.

Ionopsis.

This class of Orchids should be grown on blocks of wood and suspended in the Orchid house, they require less water than most kinds. The flowers are usually pink or white.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Ion: pulchella,	New Granada.		
2	„ tenera, ...	Havannah.	white.	
3	„ testiculata,	Hispagnola.		
4	„ utricularioides	Trinidad.	white and purple.	

Issochilus.

An epiphytal orchid having slender erect stems, flowers purple and white. It is related to "*Epidendrum.*"

No.	Names.	Country.	Colour of flowers.	REMARKS
1	Isso: fusiforme,...	Trinidad.		
2	„ globosum, ...	Martinique.		
3	„ graminifolium,	Andes.		
4	„ lancefolium,...	Guayaquil.		
5	„ linearis, ...	Martinique.		
6	„ linifolium, ...	Peru.		
7	„ proliferum, ..	Jamaica.		
8	„ teretifolium	do.		

Josephia.

Epiphytal; natives of Malabar and Ceylon; near *Vanda.*

No.	Name	Country.	Colour of flowers.	Remarks.
1	Jos. lanceolata, .	. ..	white and pink	
2	„ latifolia,	.. .	do.	

Kefersteinia.

A Small Orchid of New Grenada; leaves lanceolate, no bulb, flowers solitary.

Lacœna bicolor

An epiphytal Orchid near Acineta; native of New Granada flowers, greenish yellow and purple.

Lælia.

A very lovely class of Orchids, justly prized as much for the peculiar beauty of their colours as their size, and often fragrance—they are mostly grown on blocks of wood covered with moss, some however require pot and peat culture, as "*cinnabarina,*" "*flava*" and "*Perrinii;*" the atmosphere in which they are grown should be hot and moist, but the plants should never be exposed to the direct rays of the sun. Those marked, (*) require less heat and moisture.

No.	Name.	Country.	Colour of flowers	Remarks.
1	Lælia acuminata,*	Mexico,	white.	
2	„ albida superba*	Oxaca,	white and pink.	fragrant.
† 3	„ anceps,	Mexico,	rose lilac.	
4	„ autumnalis* ..	„	purple and rose.	
5	„ Brysiana, .	. . .	...	
6	„ cinnabarina*	Brazil.	reddish orange	
7	„ flava, . ..	Mexico, .	yellow.	
8	„ furfuracea,* ..	Oxaca, ..	rosy colour.	
9	„ grandiflora, .	Mexico,		
10	„ grandis, .	Brazil, .	nankeen and rose.	
†11	„ majalis, .	Bolanos,..	rosy lilac.	pot in rough fibrous peat.
12	„ penduncularis,	Guatemala,	lilac.	attach to block.
†13	„ Perrinii, .	Brazil, .	rosy purple.	
†14	„ purpurata, .	do.	white and purple.	
15	„ prœstans, ..	.. .	cream and pink.	
16	„ rubescens,	.. ..	.. ..	
17	„ rupestris, ...	Brazil, .	violet.	suspend loose with wire.
18	„ superbens,* .	Guatemala	rose.	

Lœleopsis Domingensis.

A pretty epiphytal Orchid—bears lilac flowers—Native of St. Domingo.

Leochilus.

A small epiphytal Orchid near Oncidium—flowers yellow. Native of South America.

Leptoceras.

An Australian terrestrial Orchid;—flowers fragrant.

Leptotes.

Small compact and evergreen not unlike a rush—should be grown either on a block of wood, or in a pot filled with a free, light compost.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Leptotes bicolor,	Brazil,	white and purple.	
2	„ concolor,	do.	white.	
3	„ serrulata,	do.	white and purple.	

Limatodes.

A Terrestrial Orchid, near Phaius, requires similar treatment.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Lim: mishmensis,	Mishmee hills		
2	„ pauciflora, ..	Java,	white.	
*†3	„ rosea,	Moulmein,	rose.	

Limodorum abortivum.

A terrestrial Orchid erect and leafless—Native of Central and Southern Europe.

Liparis.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Liparis affinis, ..	Java		
* 2	„ anceps, .	Khassia Hills		
3	„ atropurpurea,	Ceylon.		
4	„ angustifolia, ..	Java.		
5	„ barbata, ..	Ceylon.		
6	„ bracteata, ..	Upper Assam		
7	„ cœspitosa, ..	Mauritius.		
8	„ clypeolum, ..	Otaheite.		
9	„ compressa, ..	Java,		
10	„ concinna, ..	Assam.		
11	„ crenulata, .	Java.		
*12	„ cylindrostachya	Khassia.		
13	„ elata, .	E. India.		
14	„ elegans, ..	Penang.		
15	„ flavescens, ..	Mauritius.		
16	„ foliosa, .	„		
17	„ gregaria, ..	Ceylon.		
18	„ latifolia, ..	Java.		
19	„ liliifolia, ..	S. America.		
20	„ Loselii, ..	Canada.		
21	„ longipes, ..	Ceylon.		
22	„ luteola, ..	E India.		
23	„ minima, ..	Java.		
24	„ montana, ..	„		
25	„ mucronata, ..	„		
26	„ Nepalensis, ..	Nepaul.		
27	„ nervosa, ..	Japan.		
28	„ odorata, ..	E. India.		
29	„ olivacea, ..	Nepaul.		
30	„ pallida, ..	Java.		
31	„ parviflora, ..	„		
32	„ plantaginea, ..	E. India.		
33	„ purpurescens,	Mauritius.		
34	„ Rheedii, ...	Java.		
35	„ serræformis, .	Ceylon		
36	„ tradescantifolia	Java.		
37	„ vandiflora, ...	Ceylon.		

Lissochilus.

A terrestrial Orchid requiring a low temperature—should be grown in a well drained pot, not too large for the size of the plant;—good rich loamy soil with a little peat and sand will be found the best.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Lisso : Arabicus,	Arbia.		
2	„ macranthus,..	C. of G. Hope.		
3	„ parviflorus, ..	„		
4	„ roseus, ...	Sierra Leone,	bright rose and brown.	
5	„ speciosus, ..	C. of G. Hope.	yellow.	
6	„ streptopetalis,	Brazil.		

Listera.

A small terrestrial Orchid. Native of Europe, Asia and America.

Lüddemannia

A singular Orchid, near Cycnochis.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Lüdd. Pescatoria,	Venezuela,..	buff yellow.	

Luisia.

An inconspicuous Orchid, with terete leaves and minute flowers. Natives of tropical Asia.

Lycaste.

A Terrestrial Orchid—inhabiting temperate regions of Central America—should be grown in a pot carefully drained and filled with peat—the bulbs on no account to be placed below the surface—and the plant must be kept in a cool place. It flowers singly.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Ly : aromatica, .	Peru		
2	„ brevispatha, .	Guatemala,	pale green and white.	
3	„ chrysoptera, .	Mexico,		
4	„ cochleata, ...		deep orange	
5	„ crinata, ..	Mexico,	yellow.	
6	„ cruenta, .	Guatemala,	do.	
7	„ Deppii, ..	Xulapa,		
8	„ fulvescens, .	Columbia,	pale tawny and orange.	
9	„ gigantea, .	Guayaquil,	greenish brown and purple.	
10	„ leucantha, .	C. America,	white and crimson.	
11	„ macrobulbon,	Santa Martha.		
12	„ plana, ..	Bolivia,	wine red.	
†13	„ Skinnerii, ..	Guatemala,	white and rose.	moss and leaf mould
14	„ tricolor. ..	do,	pink	

Macodes petola.

A beautiful little Java Orchid—Terrestrial—very near Anœctochilus—and must be cultivated in the same way. It has oval leaves clouded and marked with a golden network.

Macradenia lutescens.

A small epiphyte—Native of Trinidad—flowers yellow and purple.

Malachadenia clavata

An epiphytal Orchid of Rio-Janerio, flowers, brown and emit the most horrible stench.

Malaxis paludosa

A small terrestrial Orchid, native of temperate Europe and Asia—flowers greenish yellow and insignificant.

Masdevallia.

A small South American epiphyte.

No.	Name.	Country.	Colour of flowers	REMARKS.
1	Masd : caudata.	N. Grenada.		
2	„ fenistrata, .	Brazil. ..	blackish, blood colour.	
3	„ infracta, ..	„		
4	„ uniflora,	Quito		

Maxillaria.

This Orchid is found growing in dry and exposed places in the forests of Brazil and elsewhere; in cultivation it should be planted in turfy peat well mixed with potsherds, thoroughly drained.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Max : acutipetala,	Central America	bright yellow.	
2	„ aggregata, ..	Andes, .		
3	„ alba, ...	Jamaica, .		
*†4	„ aromatica, ...	Mexico, .	golden.	
5	„ aureafulva, ...	.. .	orange.	
6	„ Barringtoniæ,	Jamaica, .		
7	„ bicolor, ...	.. ..		
8	„ bractescens, ...		dull yellow.	
9	„ citrina, ..	. .	yellow.	
10	„ Colleyi, ...	.. .		
11	„ concava, ..	.. .	pale yellow.	
12	„ corrugata, ...	.. .	brownish yellow.	
13	„ cruenta, ...	Guatemala, .	rich orange.	
14	„ cucullata, ...	South America	purplish brown.	
15	„ cuneiformis, ...	. .		
16	„ decolor, ...	Jamaica, .	yellowish white.	
†17	„ densa, ...	..		
18	„ Deppii, ...	Mexico, ..	blush colour.	
19	„ elongata, ...	.. ..		
20	„ foveata, ...	. .	pale yellow	
21	„ graminea, ...	.. ..	dull yellow & brown	
22	„ grandiflora, ...	Andes, ..		
23	Harrisoniæ	Brazil,	pale yellow & rose	

Maxillaria.—(Continued.)

No.	Name.	Country.	Colour of flowers.	REMARKS.
24	Max: do alba, ...	.. ..	pure white.	
25	„ hastata, ...	Pillao, ..		
26	„ hyacinthina,...	.. ..	white and rose.	
27	„ latifolia, ...	Andes, .	yellow and red.	
28	„ lentiginosa, ...	Brazil, ..	yellow.	
29	„ leptosepala, ...	New Grenada,	white.	
30	„ lingulata, ...	Pillao, ..		
31	„ longifolia, ...	Guayana,	purple,	
32	„ longipetala, ...	Peru, ..		
33	„ lyncea, ...	Mexico, ...		
34	„ macrobulbon,	Santa Martha,		
35	„ macrophylla,...	. .	yellow and brown.	
36	„ maculata, ...	Amazon, ..	green.	
37	„ ochroleuca, ...	Brazil, ..		
38	„ pallidiflora, ...	St. Vincent, .	green.	
39	„ palmifolia, ...	Jamaica, ..		
40	„ paniculata, . .	Pillao, .		
41	„ Parkeri, ...	Demerara, .		
42	„ parvula, ...	Brazil, .		
†43	„ picta, ...	„	orange and purple.	
44	„ platypetala, ...	Peru, .		
45	„ prolifera, ...	. .		
46	„ punctulata, ...	Brazil, ..	yellow and purple.	
47	„ racemosa, ...	„		
48	„ ramosa, ...	.. ..		
49	„ revoluta, ...	..	yellow. [red.	
50	„ Rollisonii, ...	Brazil, ..	light yellow pink &	
51	„ rufescens, ...	.. ..		
52	„ scabrilinguis,	.. ..	purplish yellow.	
53	„ Skinnerii, ...	.. ..	blush colour.	
54	„ squalens, ...	Brazil, ..	yellow.	
55	„ spathacea, ...	„ ..		
56	„ stapeloides, ...	„ ..	green and purple.	
57	„ Steelii, ...	Demerara, ..	yellow and purple.	
58	„ subulata, ...	Brazil, ..	[scarlet.	
†59	„ tenuifolia ...	Vera cruz, ..	greenish yellow &	
60	„ tetragona, ...	Brazil, ..		
61	„ tricolor, ...	.. ..		
62	„ triphylla, ...	.. ..		
63	„ undatiflora, ...	.. ..		
64	„ undulata, .	Peru, ..		
†65	„ variabilis lutea,	.. ..		
66	„ variegata, ...	Peru, ..		
67	„ viridis, ...	Brazil, ..		
68	„ vitellina, ...	„ .	deep yellow & brown	
69	„ Warreana, ...	„ ..		
70	„ xanthina, ...	.. ..	bright yellow.	

Megaclinium.

A small Orchid of Tropical Western Africa, flowers yellowish brown.

Micropera.

Epiphytal—small—natives of India.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Mic: Maculata. ..	E. Indies, ..	yellow & purple.	
2	„ pallida, ..	„ ..	now called *Camarotis.*	

Microstylis.

Terrestrial.

No.	Name.	Country.	Colr. of flowers.	REMARKS.
1	Mic : discolor, ...	Rangoon, ...	purple,	variegated.
2	„ Rheedia, ...		yellow.	
3	„ versicolor, ..		do,	variegated foliage

Miltonia.

A compact evergreen epiphytal Orchid of great beauty; the treatment mostly recommended is the same as that for Cattleyas only they prefer a little more heat and moisture, some do well on a block but mostly they are grown in pots not too large; well drained and filled with peat.

Miltonias are nearly all remarkable for their unhealthy yellowish colour

No.	Name.	Country.	Colour of flowers	REMARKS.
1	Mil: atrorubeus,	Mexico.		
2	„ bicolor.	„		
3	„ candida,	„	yellow and pink.	
4	„ do. var. flavescens,	„	do. and purple.	
5	„ do. var. grandiflora,	„	do. larger.	
6	„ Clowesii,	„	yellow & chocolate.	
7	„ cuneata,	„	brownish purple.	
8	„ Karwinskii,	Brazil,	yellow and brown.	
9	„ Morelii,	Mexico,	white and violet.	
10	„ Russeliana,	„	brown and yellow.	
*11	„ spectabilis,	„	white and violet.	

Monochilus.

A Terrestrial Orchid near Goodypa.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Mono: affine,	Burmah,		
2	„ flavum,	Nepaul,		
3	„ longilabre,	Ceylon,	white.	
4	„ nervosum,	E. J.		
5	„ regium,	Ceylon,	white.	

Mormodes.

Should be grown in pots with a peat soil and supplied with plenty of moisture.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Mor : aromaticum,	Mexico, ...	pale pink.	
2	„ atropurpureum,	C. America,	dark purple.	
3	„ barbatum, ...	„	„	
4	„ buccinator, ..	Venezuela,...	white.	
5	„ Cartoni, ...	C. America,	flesh colour.	
6	„ citrinum, ...	Mexico, ..	yellow.	
7	„ flavidum, .	C. America,	„	
8	„ igneum, ..	„	chocolate colour.	
9	„ lineatium, ...	Guatemala,	olive green.	
10	„ lentiginosum,	C America,	deep red.	
11	„ luxatum,	Mexico, .	pale lemon.	
12	„ pardnum, ...	„	bright yellow, ...	fragrant.
13	„ roseoalba, ...	.. ...	white and rose.	
14	„ speciosum, ..	Oceana, ..	yellow and cinnamon.	

Myoda.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Myoda rufescens,	Penang.		

Nanodes discolor.

A small Vandeous Orchid from the West Indies, leaves purplish green with purple bands.

Neippergia chrysantha.

A Mexican epiphytal Orchid near Acineta, flowers golden yellow and fragrant at night.

Neottia.

Terrestrial and temperate, near Listera, four species are known, one of which Neottia Nidusavis (the Bird's nest Orchis) is a native of Britain.

Nephelaphyllum.

A Terrestrial Orchid.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Neph. pulchrum,	Java, ...	purplish.	
2	„ tenuifolium,	do.		

Notylia.

A Tropical American epiphytal Orchid having a pseudobulb with a single leaf, the flower is insignificant.

Oberonia.

A large genus of epiphytal Orchids 50 species are described.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Oberonia anthropophora, ..	Tavoy,		
2	„ bicornis, ..	Sylhet,		
3	„ brevifolia, ..	Mauritius,		
4	„ caulescens, . .	Nepaul,		
5	„ imbricata, .	Java,		
*6	„ iridifolia, ...	Nepaul, &c.		
7	„ longibracteata,	Ceylon,		
8	„ lunata, ..	Java,		
9	„ microphylla, .	„		
10	„ monstruosa, .	„		
11	„ Myosaurus. .	Nepaul,		
12	„ semilis, ..	Java,		

Odontoglossum.

An evergreen Orchid having stout bulbs, compact in its growth, should be grown in pots or baskets containing peaty mossy soil thoroughly drained. Temperature should be somewhat lower than for other Orchids. Atmospheric moisture and shade necessary during summer and comparative cold and dryness in winter.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Odont. anceps, ...	N. Grenada,	blush white and yellow.	
2	„ Alexandriæ, ..	Brazil, ...	green yellow.	
3	„ apterum, ...	Mexico, ..		
4	„ Bictoniense, .	Guatemala,...	lilac and brown.	
5	„ Bluntü, ..	N. Grenada,	white and blush.	
6	„ cervantesü,	„	white and rose.	
7	„ cirrhosum, ...	Guayaquil, .		[night.
8	„ citrosmum, ...	Guatemala,	white and pink, ...	fragt. at
9	„ cordatum,	Mexico, ...	green.	
10	„ cuspidatum,..		green and brown.	
11	„ Ehrenbergü,	Mexico, ..	white spotted brown.	
†12	„ epidendroides,	Amazon,		
13	„ grande, .	Guatemala,	brown and yellow. ...	block.
†14	„ gloriosum, ...	Andes, .	creamy white and red.	
15	„ hastilabrum,	S. America,	purple-green and white	
16	„ Insleyaü, ...	Mexico, ..	brown yellow & orange.	
†17	„ læve, .	Guatemala,	yellow and cinnamon.	
18	„ Lindleyanum,	...	yellow and white	
19	„ maculatum, ..	Mexico, .	deep brown & yellow.	
*20	„ maxillare, ...	„	white and yellow.	[block.
21	„ membranaceum	Guatemala,	pure white. ..	fragrant
22	„ nebulosum, ..	N. Grenada,	white crimson & yellow	
23	„ Pescatorei, ..	„	white and pink.	
24	„ pulchellum,	Guatemala,	white and crimson.	
25	„ radiatum, ..	... ...	yellow and brown.	
*26	„ Rossü, .	Mexico, .	white and purple.	
27	„ rubescens, .	Nicaragua,..	blush and crimson.	
28	„ stellatum, ...	.. ...	white and lilac.	
29	„ uro Skinneri,			
30	„ Warczewiczü,			
31	„ Warnerü,	Mexico,	yellow and crimson.	

Œceoclades.

An epiphytal Orchid, very like Saccolabium, has fleshy spotted leaves.

No.	Name.	Country	Colour of flowers.	REMARKS.
1	Œceo : flexuosa,	Ganges-Sunderbunds,		
2	„ falcata, ..	China,		
3	„ funalis, .	Jamaica,		
4	„ gracilis, ...	Mauritius,		
5	„ maculata, ..	Brazil & Mauritius	rose and white.	
6	„ paniculata, ..	Sylhet,		
7	„ parviflora, ...	Mauritius,		
8	„ pusilla, ..	Sylhet,		
9	„ Retzii, ..	E. I.		
10	„ tenera, ..	Ceylon,		

Œonia.

Near Angræcum, flowers very showy, Epiphytal.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Œnia Aubertii,	Madagascar.		
2	„ brachystachya,	Mauritius.		
3	„ macrostachya,	Bourbon.		

Oncidium.

Like Odontoglossum, this class of Orchids possesses short stout bulbs, and evergreen foliage, and in every respect requires similar treatment, they will as a rule flourish in a higher degree of temperature.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Oncid: altissimum	W. Indies,..	yellow and brown,	flower spray often 13 ft. long.
2	„ amictum, ..	Brazil, .	yellow and brown.	
† 3	„ ampliatum, ..	Guatemala,	yellow.	
4	„ barbatum, ..	Brazil, . .	yellow and brown.	
5	„ Barkerii, ..	Mexico, .	„	
6	„ Baueri, .	Panama,	„	
† 7	„ bicallosum, ..	Guatemala,	dark brown.	
8	„ bicolor, ..	Spanish main	deep yellow.	block.
† 9	„ bifolium, ..	Monte Vides	yellow and brown.	„
10	„ carthaginense,	W. Indies,	olive brown.	
11	„ Cavendishii, ..	Guatemala,	bright yellow.	
† 12	„ cebolleta, ...	W. Indies		
13	„ ciliatum,			
14	„ citrinum. ...	Trinidad, ..	bright yellow.	basket large flowers.
15	„ concolor, ..	Organ Mt.	yellow.	
16	„ convolvolaceum	Venezuela,		
17	„ cornigerum, ..	Brazil,		
18	„ corynephorum,	Peru, ..,	pale cinnamon.	flower spray often 20 ft. long.
19	„ cosymbiphorum	.. ..	rose and crimson.	
20	„ crispum, ..	Organ Mt. ...	copper colour	block.
21	„ cucullatum, ..	New Grenada,	red violet and purple.	
22	„ cultratum, .	Popaya		
23	„ curtum, ...	.. .	yellow and brown.	
24	„ deltoideum, ...	Peru, ...	bright yellow & red.	
25	„ digitatum, ..	Guatemala,	green and white.	
26	„ divaricatum, ...	Brazil, .	orange.	
27	„ echinatum, ...	Mexico.		
28	„ emarginatum,	Essequibo.		
29	„ ensatum, ..	Guatemala,	yellow and brown.	
30	„ excavatum, ..	Peru, ...	„	
31	„ falcipetalum,	Venezuela,	brown ...	flower spray 20 ft. long, each flower about 3 inches in diameter
32	„ flabelliferum,	Brazil, .	„	
33	„ flexuosum, ..	„ ..	yellow.	
34	„ Forbesii, . .	„ ...	yellow scarlet & white.	
35	„ fimbriatum, ..	„		
36	„ funereum, .	Mexico,		
37	„ globuliferum,	Andes.		

Oncidium,—(Continued.)

No	Name	Country	Colour of flowers.	REMARKS.
38	Oncid gracile,	Brazil,	yellow	
39	„ hæmatochilum	New Grenada,	greenish yellow and crimson	
40	„ Harrisonianum	Brazil.		
41	„ Hartwegii,	Peru,	brownish yellow	
42	„ hastatum,	New Grenada,	white	
43	„ Henchmanni,			
44	„ hians,		brown and yellow	
45	„ Huntianum,	Brazil.	pure red	
46	„ hyalinobulbum,	Mexico,		
47	„ incurvum,	„	white and red	
48	„ Insleayanum	„	yellow and brown.	
49	„ iridifolium,	Guaya,	yellow	
50	„ Jamesonii,	Peru,	„	
51	„ Karwinskii,	Oaxaca,	yellow and brown.	
52	„ lacerum,	Panama,		
53	„ Lanceanum,	Guayana,	yellow and crimson,	basket & moss
54	„ lancefolium,			
55	„ leucochilum,	Mexico,	green and white	
56	„ longifolium		yellow and brown	
† 57	„ longesses,	Brazil,		
58	„ lunatum,	Demerara,	primrose and brown	
59	„ luridum,	Jamaica,	yellow brown and red	
60	„ macranthum,	Mexico,	green and purple	
61	„ macrochilum,	Guatemala,	snow white & crimson	fragrant
62	„ maizæfolium,	N Grenada,	yellow and red	
63	„ monoceras,	Rio Janerio,	greenish red	
64	„ Nanum,	Guiana,	bright yellow sp with red	
65	„ nebulosum,	Guatemala,	yellow and brown	
66	„ nigratum,	Guiana,	cream and black	
67	„ nubigenum,	Andes,		
68	„ oblongatum,	Mexico,	sulphur with crimson spots,	
† 69	„ olivaceum,	Popaya		
70	„ onustum,	Panama		
71	„ ornithorynchum			
†*72	„ pachyphellum	Mexico,	orange and reddish purple,	
73	„ panduriferum,	N. Grenada		
74	„ papilio,	Trinidad,	brown and yellow	
75	„ pauciflorum,	Mexico.		
76	„ pectorale,			
77	pelicanum,	Mexico,	yellow and brown	
78	„ phymatochilum	Brazil,	green and white.	
79	„ Phillipsii,			
80	„ pictum	Popaya,	yellow and brown	
81	„ planilabræ,	Brazil,	„	

Oncidium,—(Continued.)

o.	Name.	Country.	Colour of flowers.	REMARKS.
82	Oncid: pubes, ..	Brazil, ...	greenish yellow.	
83	„ do. var. flavescens,			
84	„ pulchellum. ,			
85	„ pulvineatum...	Brazil, ...	yellow and crimson.	
86	„ pumilum, ..	„	yellow and brown.	
87	„ pyrimidale, ..	Peru.		
88	„ quadricorne,	...	brownish yellow	
89	„ ramosum, ...	Brazil, ..	pale yellow,	
90	„ raniferum, ..	Brazil,	yellow and brown.	
91	„ reflexum. .	Mexico,		
92	„ Reidianum, .		greenish brown.	
93	„ retusum, ..	Peru, .	yellow and brown	
94	„ Rigbyanum,..	„	„	
95	„ roseum.	Honduras,..	rose spotted red.	
96	„ Russelianum,			
97	„ sanguineum,	La Guayra,	straw and crimson.	
98	„ sarcodes, .	Braxil,	yellow and crimson.	
99	„ Schlimii, ..	Central America,	yellow and brown.	
100	„ serpens, ..	Peru,	„	
101	„ serratum, .	„	brownish olive.	
102	„ sessile,	Santa Martha	yellow and cinnamon.	
103	„ sphacelatum,	Honduras,	brown.	
104	„ sphigeferum,	Braxil,	pale yellow.	
105	„ sphilopterum,	Mexico,	yellow and crimson.	
106	„ Sprucei, .	Brazil, ...	...	terete leave
107	„ stramineum,..	„	straw colour.	
108	„ suave, ..	„	primrose & cinnamon	
109	„ Suttonii, ..	Guatemala,	yellow and olive.	
110	„ tenue, ..	„	yellow and brown.	
111	„ tetrapetalum,	Jamaica,		
112	„ tigrinum, ..	Mexico,		
113	„ tricolor, ...	Jamaica,	white red and yellow.	block.
114	„ trilingue, .	Peru,	brown yellow & purple	
115	„ triquetrum, .			
116	„ trulliferum, ..	Brazil,	yellow brown & white.	
117	„ unguiculatum,	Guatemala,	yellow and crimson.	
118	„ uniflorum, ..	Brazil,	brown and red.	
119	„ urophyllum,..	„	clear yellow.	
120	„ varicosum, ..	„	bright yellow.	
121	„ variegatum, ..	Havanuah,..	rose.	
122	„ velutinum, ..			
123	„ viperinum, ..	Uraguay,		
124	„ Wentworthianum, ..	Guatemala,	yellow and brown	
125	„ Wrayœ, ..	Mexico,	bright yellow.	

Ophris.

A temperate Terrestrial Orchid, Native of Europe,

No.	Name.	Country.	Colour of flowers	REMARKS.
1	Ophris : apifera,	Britain, ..	. .. ...	The Bee Orchid.
2	,, muscifera, ..	do,	... ..	The Fly Orchid

Orchis.

Terrestrial—Native of North-America, Europe and Asia.

No.	Name.	Country.	Colour of flowers	REMARKS.
1	Orchis conopoea, ..	..	pink.	
2	,, coriophora,			
3	,, Jusca,			
4	,, hircina, ..	.. ..	. .. ..	the lizard orchid.
5	,, latifolia,	.. ..	pink.	
6	,, laxiflora,			
7	,, maculata,			
8	,, mascula,			
9	,, militans,			
10	,, moris,			
11	,, pyrimidalis,			
12	,, tephrosanthus ..	...	. ..	the monkey orchid.
13	,, ustulata, ..	... ..	deep purple.	

Oreorchis.

A Terrestrial Orchid of Northern and India, and central Asia, has grassy leaves, and flowers generally red and white.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Or : foliosa,			
2	,, lancifolia,			
3	,, micrantha, .	Japan.		
4	,, patens, .	Siberia.		

Ornithochilus.

In appearance very like *Phalænopsis,* bears a small but curious flower.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Orni : fuscus, ..	Sikkim, ..	green red and yellow.	
2	„ striatus, .	do.	purple.	

Otochilus.

A Terrestrial Orchid bearing insignificant flowers.

No.	Name	Country.	Colour of flowers.	REMARKS.
1	Oto : albus, .	Nepaul, ...	white	
2	„ fuscus, .	„		
3	„ porrecta .	E. I.		

Pachyphyllum.

A small epiphytal Orchid, native of Tropical America, flowers are small and uninteresting, about six species are known.

Paphinia.

Dwarf, short bulbs, should be grown in pots with rough fibrous peat, plant well raised above the rim of the pot and drainage perfect; this is a very curious little plant.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Paphinia cristata, .	Trinidad. ...	dark chocolate & purple	

Paxtonia.

A terrestrial Orchid nearly allied to *Bletia*, and requires the same treatment.

No.	Name.	Country.	Colour of flowers.	**Remarks.**
1	Paxtonia rosea. .	Manilla, .	rosy pink.	

Pelexia.

A Terrestrial Orchid of Tropical America, near *Neottia.*

Peristeria.

Require very similar treatment to *Phaius*, large bulbs, should be grown in a mixture of loam and leaf mould, powerful heat and abundant moisture. A long rest is necessary during which the plant should never be watered.

No.	Name.	Country.	Colour of flowers.	**Remarks.**
* 1	Peristeria alata, ..	Panama, ..	white waxy. ..	Flower Like a dove.
2	„ Barkeri, .	Xulapa,		
3	„ cerina,	Spanish Main.	yellow.	
4	„ guttata, ..	S. America,	red and yellow.	
† 5	„ Humboldtii, ..	Venezuela.	chocolate.	
6	„ do. var fulva, ..	„	tawny yellow spot-purple	
7	„ pendula maculata.	Demerara,		

Pesomeria tetragona.

A terrestrial Orchid near *Bletia.* Native of Bourbon, the flowers are large, and of a reddish brown colour internally, green externally.

Phaius.

The different descriptions of *Phaius* or *Phajus* are mostly large, with luxuriant foliage, the stems only last one year and the whole plant dies down, They should be grown in pots of large size filled with loam, leaf mould and a small quantity of rotten cowdung.

The greatest care must be taken lest the young growth be touched by water, and the stems likewise must never be wetted. They require a long *rest* and forcing is very hurtful.

No.	Name	Country	Colour of flowers.	REMARKS.
†1	Phaius albus,	Nepaul,	white and purple.	
2	„ bicolor,	Ceylon,	large yellow and white	
3	„ Blumei,	Java,		
4	„ callosus,	„		
5	„ flavus,	„		
6	„ grandifolius,	China and Nepaul,	white and brown.	
7	„ maculatus,	Nepaul,		
8	„ veratrifolius,	Sylhet,		
† 9	„ Wallichii,	Khassia Hills,	orange and purple.	

Phalænopsis.

The "*Queen of Orchids*;" evergreen leaves, short stems, long roots, should be fastened to a small block of wood well covered with moss, and sunk in a pot filled with some free and light compast, the leaves should never remain wet but should often be sponged. Damp, moist and humid atmosphere necessary. Flower stalks should be cut just below the last bud when they will again throw out fresh stalks and blossom.

No.	Name.	Country.	Colour of flowers.	REMARKS.
*†1	Phal : amabilis, ...	Manilla, ..	white and rose.	
*†2	,, grandiflora, ..	Java, ..	white and yellow.	
3	,, intermedia, ..	Manilla, ..	white and rose.	
*†4	,, Parishii, ..	Moulmein, .	white purple lip.	
5	,, rosea, ..	Manilla,	rose.	
6	,, cornu cervi, ..	Moulmein,	pale green with cinnamon bars.	
* 7	,, Lowii,			
8	,, Lüddemanniana,			
9	,, Ruckeri,			
†10	,, Schilleriana, .	. .	delicate purple, ..	leaves variegated like *Cyprepedium concolor.*
11	,, Sumatrana, .	Sumatra,	creamy yellow, ..	red bars.

Pholidota.

The Rattle snake Orchid, deciduous, should be grown either fastened to a block or in a pot filled with jammah, leaf soil and moss, flowers not particularly handsome.

No.	Name.	Country.	Colour of flowers.	REMARKS.
* 1	Pho : articulata, ..	E. Indies, ..	brown and white.	
2	,, carnea, ...	Java.		
3	,, clypeata, .	Borneo,	dirty white.	
4	,, globosa, ..	Java,		
* 5	,, imbricata, ..	E. I. & Ceylon		
6	,, recurva, .	Nepaul.		
7	,, rubra, ...	E. I.		
8	,, undulata, ..	,,		
9	,, multibrachteata,	... ..	orange and white.	

Phreatia.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Phr : coriacea, ..	Java,		
2	„ densiflora, ..	„		
3	„ elegans, ..	Ceylon,		
4	„ laxiflora, ..	Java,		
5	„ pusilla, ..	„		
6	„ retusa, ..	„		
7	„ secunda, ..	„		
8				

Pilumna.

An Epiphytal Orchid of Popaya, related to *Brassia*, flowers green and white.

Platanthera.

A Terrestrial Orchid, native of temperate Europe, Asia and America.

Pleione.

A section of Cœlogyne, with which it has been included.

No.	Name	Country	Colour of flowers.	REMARKS.
1	Pleione diphylla,	See Cœlogyne.		
2	„ humilis,			
3	„ Lazenaria,			
4	„ maculata,			
5	„ prœcox,			
6	„ Wallichiana,			

Pleurothallis.

An Epiphytal Orchid.

No.	Name.	Country	Colour of flowers.	REMARKS.
1	Pleuro: alpestris,	Jamaica,		
2	„ bicarinata,	Brazil,	orange and red	
3	„ cordata,	Peru,		
4	„ emarginata,	„		
5	„ hemirhoda,	Columbia,	white and red.	
6	„ lanceolata,	Peru,		
7	„ laurifolia,	Andes,		
8	„ macrophylla	Peru,		
9	„ pendunculata,	Caraccas,	green.	
10	„ prolifera,	Brazil,		
11	„ pulchella,	Quito,		
*12	„ racemiflora,	Jamaica,		
13	„ ruscifolia,	„		
14	„ spiralis,	Peru,		
15	„ succosa,	„		
16	„ tribuloides,	Jamaica,		
17	„ laxa,	„		
18	„ recurva,		purple and violet	

Pogonia.

A terrestrial genus containing about 20 species, native of America and Asia, flowers solitary or loosely racemose.

Podochilus.

No.	Name.	Country.	Colour of flowers	REMARKS.
1	Podo : cultratus, ..	Nepaul.		
2	„ falcatus, ..	Ceylon.		
3	„ gracilis, ...	Java.		
4	„ lucescens, .	„		
5	„ microphyllus, ..	Penang & Sylhet		
6	„ saxatilis, ..	Ceylon.		
7	„ tenuis, ...	Java.		

Ponthieva.

A Terrestrial West Indian Orchid near Neottia.

Prescottia.

A Tropical American terrestrial Orchid, flowers green, near Neottia.

Promenœas.

Dwarf, grow in pots with a peaty soil.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Promenœas lentiginosa,	Brazil.		
2	„ Rollissonii,	„	pale yellow.	
3	„ stapelioides,	„ ..	green and yellow	

Renanthera.

A long climbing Orchid, very regular and upright in its growth. It should be bound with moss at the bottom of a tall stump 5 ft. in height, and allowed to climb about a foot above it.

No.	Name.	Country.	Colour of flowers	REMARKS.
*†1	Renan : arachnites, .. called elsewhere "Arachnauthe moschifera"	Java, ..	brown and yellow.	
*†2	„ coccinea, ...	China, .	scarlet.	
† 3	„ elongata, . ..	Java,		
4	„ Lowii, . .	Borneo,	.. ..	leaves a yard long.
5	„ matutina, ...	Java, ..	brown and yellow.	
6	„ Sulingi, ...	„		

Restrepia,

A Tropical American epiphytal Orchid, near *Pleurothallis,* flowers large, and generally spotted.

Rodriguezia,

An Epiphytal Orchid. Native of West Indies.

Saccolabium.

A compact and evergreen Orchid, bearing long racemes of beautiful blossom, should be grown on a block of wood, the roots are long and project out into the air and the leaves should be frequently syringed and sponged.

No.	Name.	Country	Colour of flowers	REMARKS.
1	Sacc : acutifolium,			
† 2	,, ampullaceum,	Sylhet,	rosy pink.	
3	,, aphyllum,	Mauritius,		
4	,, ascendens,	Moluccas,		
† 5	,, Blumei,	Java.	violet and white.	
6	,, do. major	do,	do.	
7	,, brachteatum,			
8	,, brevifolium,	Ceylon,		
9	,, calceolare,	Khassia Hills	yellow and red.	
†10	,, carinatum,	do.		
11	,, clavatum,	E. I		
12	,, coriaceum,	Madagascar.		
†13	,, curvifolium,	Nepaul.	vermillion.	
14	,, dasypogon,	,,		
15	,, densiflorum,	Sylhet & Penang		
†16	,, denticulatum,	Sylhet,	yellow and purple	
17	,, giganteum,	Burmah,		
18	,, gracile,	Ceylon.		
†19	,, guttatum,	India...	white and purple.	
†20	,, macranthum,	Nepaul,	rose colour.	
†21	,, miniatum,	Java,	vermillion.	
22	,, niveum,	Ceylon,		
23	,, oblignum,	E. I.		
24	,, pallens,	Khassia Khls,		
†25	,, papillosum,	Malabar,	yellow and purple.	
†26	,, præmorsum,	,,	white and lilac	
27	,, pusillum,	Java,		
28	,, raceferum,	E. I.		
29	,, ramosum,,	Ganges,		
30	,, reflexum,	Singapore.		
31	,, retusum,	Malabar,		
32	,, ringens,,	Madras,		
33	,, rigidulum,	Sylhet,		
34	,, roseum,	Ceylon.		
35	,, spicatum,	Nepaul		
36	,, striatum,	Bourbon,		
37	,, undulatum,	Sylhet,		
38	,, Wightianum,	E. I.		

Sarcanthus.

Not unlike Saccolabium, flowers in racemes, should be grown in a basket filled with moss.

No.	Names	Country.	Colour of flowers.	Remarks.
1	Sar: affinis, ...	Khassia Hills.		
2	„ junceus,	Assam.		
3	„ pallidus,	„		
4	„ paniculatus, ..	China.		
† 5	„ oxyanthus,	Assam.		
6	„ rostratus, ...	China.		
7	„ succisus,	„		
8	„ seretifolius,	„		
9	„ guttatus, ..	India,		
*10	„ latifolius,	Assam,	scarlet.	

Sarcochilus.

An insignificant Australian Vandeous epiphytal Orchid.

Sarcoglottis.

An insignificant terrestrial West Indian Orchid near Spiranthes

Sarcopodium.

An epiphytal Orchid near Dendrobium, and Native of Asia.

Satyrium.

A South African and Indian terrestrial Orchid.

Sauroglossum-elatum.

A Terrestrial Orchid of South Brazil, bears a dense spike of small green flowers.

Scaphyglottis.

A Vandeous Orchid of Peru and Brazil.

Schlimmia.

An epiphytal Orchid near Vanda.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Schlimmiajasminodora,	C. America,	white.	fragrant.

Schanorchis juncifolia.

An epiphytal Orchid of Java, near Saccolabium.

Schomburgkia.

Requires a cool house, long rest, and similar treatment to Lælias.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Schomb : crispa ..	Demerara, ..	yellowish brown.	
2	„ marginata, ..	Surinam, .	orange red and lilac	
3	„ rosea, ...	Siena nevada	rose colr. & deep red	
4	„ tibicinis, . .	Honduras,	purple and yellow	
5	„ violacea, ...	. ..	violet	
6	„ undulata, . .	La Guayra,	lively purple.	

Scuticaria.

An epiphytal Orchid, having long strap-like leaves, flowers large. Grow on a block of wood placed in a pot filled with moss.

No.	Name.	Country.	Colour of flowers.	REMARKS
1	Scuticaria Steelii, ..	Demerara, ..	cream and crimson,	

Sobralia.

A terrestrial Orchid having slender tall reedy stems, should be grown in a large pot, shallow and well drained. Soil, light loam, sandy peat, or fibrous heath soil and leaf mould; when growing the pot should be placed in a pan full of water.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Sobralia biflora,	Peru,		
2	„ caravata,	Guayana		
3	„ chlorantha,	Brazil,	yellow	
4	„ dichotoma,	Peru,	white out side, violet inside.	12 to 20 feet high.
5	„ fimbriata,	„		
6	„ liliastrum,	Guayana,	white,	
7	„ macrantha,	Guatemala,	purple and white.	flowers 8 inches in diameter.
8	„ do splendens,	„	„ darker.	
9	„ rosea,	Peru,		
10	„ sessilis,	Demerara,	pale pink.	
11	„ setigera,	Peru,		

Solenidum.

An epiphytal Orchid near *Oncidium.*

No.	Name.	Country.	Colour of flowers.	Remarks
1	Solenidum racemosum	New Grenada,	yellow and brown	

Sophronites.

Similar to the Cattleya only smaller, grow on a small stump covered with moss, evergreen.

No.	Name.	Country.	Colour of flowers.	Remarks.
*†1	Soph : cernua	Brazil,	scarlet and yellow	
† 2	„ grandiflora,	„	cinnabar and yellow.	
3	„ pterocarpa	„	rose purple.	
4	„ violacea,	„	violet	

Spathoglottis.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Spath : aurea, ..	Malaccas, ..	yellow.	
2	,, Fortuni, ..	Hongkong, .	,, & crimson.	
3	,, ixioides,			
4	,, parviflora, ...	Sylhet, ..	yellow.	
* 5	,, plicata, ...	Penang,		
6	,, pubescens,	Sylhet, ..	yellow.	
7	,, tomentosa, ..	Mendanao, ..	do. ..	very fine.
8	,, trivalvis, ..	Singapore,		

Spiralis.

A terrestrial Orchid of America, flowers small, spike is spirally twisted.

Stanhopea.

An ever green Orchid having short bulbs, the flowers are projected downwards through the roots. It is best grown in small shallow baskets, open at the bottom and sides, soil peat and moss, a very good plan is to grow the plant in a fork of mangoe wood, having three or four projecting supports and fill the interstices with peat and moss.

No.	Name.	Country	Colour of flowers.	REMARKS.
1	Stanhopea aurea ..	Guatemala, ...	yellow.	
2	,, Bucephalus,	Guayaquil,	deep orange, ..	fragrant
3	,, cirrhata, ..	Necaragua.		
4	,, Devoniensis, ..	Mexico, ..	orange and red.	
5	,, eburnea, .	Brazil.		
6	,, ecornuta,	C. America, ..	white and yellow.	

Stanhopea.—(Continued.)

No.	Name.	Country.	Colour of flowers.	
7	,, grandiflora, .	Trinidad, ..	white.	
8	,, graveolens, ..	Guatemala, .	straw colour.	
9	,, insignis, . .	Trinidad, .	white.	
+10	,, Martiana, ..	Mexico,	straw and red, .	fragrant.
11	,, do. var : bicolor,	,,	do. do. and white	
12	,, oculata, . .	,, ..	yellow and purple.	
13	,, quadricornis,	Spanish Main,	cream and purple.	
+14	,, tigrina ..	Mexico,	yellow & chocolate.	
15	,, do. lutescens, .	,,	orange & chocolate.	
16	,, Wardii, . ..	La Guayra,	yellow and orange.	
17	,, tricornis, ..	Peru, ..	pink and white.	
18	,, inodora, . .	Mexico, .	pale green & yellow.	
19	,, saccata,			

Stelis.

A small South American and West Indian epiphyte, flowers green, yellow and purple, when touched the flower is extremely irritable.

Stenia pallida.

An epiphytal Orchid, native of Demerara, flowers, large and yellow.

Stenocoryne.

A Demerara Orchid, epiphytal, flowers orange and brown.

Stenorhynchus.

A Terrestrial Orchid of Tropical America, flowers hairy and showy.

Tetrapeltis.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Tetra : fragrans, ..	Nepaul,		

Thelymitra.

A terrestrial Orchid of Australia and New Zealand; flowers blue, white, pink and yellow. It is related to Neottia.

Thetærea.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Thetærea variegata, ..	Java.		
2	,, Javanica, .. .	,,		

Theisteria.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Theisteria veratrifolia.	Java.		

Tipularia discolor.

A North American terrestrial Orchid, flowers green and purple.

Trias.

No.	Name.	Country.	Colour of flowers.	REMARKS.
1	Trias : oblongata, ..	Khassia Hills.	dark green.	
2	,, ovata, . ..	E. I.		
3	,, racemosa, ..	.. ..	green and purple.	

Trichoglottis.

An epiphytal Orchid near Phalænopsis.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Trich : lanceolaria.	Java.	green and white.	
2	,, pallens, ..	Manilla,		
3	,, retusa, ...	Java.		
4	,, rigida,	,,		

Trichopelia.

Dwarf and evergreen, grow in pots with a peaty soil.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Trich ; albida, ...	Caraccas, ..	white and yellow.	
2	,, candida.			
3	,, coccinea,	C. America.	yellow and crimson.	
† 4	,, Galleottiana.	Mexico,	large yellow,	
† 5	,, suavis, ..	do.	white and pink.	
6	,, tortilis, ..	do.	brown and yellow.	
7	,, crispa,			
8	,, picta, ...	...	greenish yellow.	

Trichosma.

Grow on a block of wood.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Trichosma suavis, ..	Cherra poonjee	white and yellow,	fragrant.

Trigonidium.

An epiphytal Orchid of Tropical America, flowers solitary.

Trizeuxis.

An epiphytal Orchid, native of Tropical America and Trinidad, flowers greenish.

Uropedium.

Terrestrial, grow in compost of fibry loam, sand and leaf mould, also some cakes of cowdung; near Cypripedium.

No.	Name.	Country.	Colour of flowers	REMARKS.
1	Uro: Lindenii,	New Grenada,	white and green.	

Vanda.

These beautiful Orchids are to be found only in the East Indies and China, they are very similar to Aerides, and Saccolabiums and require the same treatment; some however do best if planted in pots or baskets filled with charcoal jammah, bark and moss. Warm humid atmosphere, frequent syringing and sponging and perfect drainage being essential.

No.	Name	Country	Colour of flowers.	REMARKS.
1	Vanda Batemanii,	Philippines, ...	yellow and purple.	
*†2	" Cathcartii, ..	Darjeeling, ...	scarlet and yellow.	
*†3	" cœrulea, ..	Assam, ..	lilac.	
4	" concolor, .	China.		
5	" congesta, ..	E. I. .. .	yellow and crimson.	
*†6	" cristata, .	Nepaul, ..	green.	
† 7	" densiflora,	do.	white and brown.	
†8	" furva, .	Moluccas, ...	copper and pink.	
*†9	" gigantea, .	Burmah, .	yellow and cinnamon.	
10	" Griffithii, .	Monas River,	yellowish brown & lilac.	
11	" helvola, .	Java, .. .	wine red and purple.	
12	" Hendsii, .	New Guinea,		

Vanda.—(Continued.)

No.	Name.	Country.	Colour of flowers.	Remarks.
13	Vanda insignis, ..	Timor and Java,	pinkish yellow & white.	
† 14	,, Jenkensii, ..	Assam.		
15	,, lamellata, ...	Philippines, ..	pale yellow and red.	
16	,, lissochiloides,	Moluccas,		
17	,, limbata, ..	Java, . .	ochre colour & rose lilac.	
18	,, longifolia, .	Tavoy, ..	yellow.	
19	,, Lowii,	Java, ...	yellow and cinnamon	
*†20	,, multiflora, .	Nepaul, China &c. ..	yellow and sanguine.	
21	,, parviflora, .	Bombay, .	ochre.	
22	,, penducularis,	Ceylon, ..	pale green and purple.	
23	,, spathulata,	Mysore & Malabar, ..	golden.	
24	,, suavis,	Java, .	white and crimson.	
25	,, teres,	Sylhet, ..	purple.	
*†26	,, tessellata, ...	Bengal,	white and purple.	also called V. *Roxburgha*
27	,, tricolor, ..	Java, ...	yellow and crimson.	
28	,, unicolor, ...	..	light brown	
29	,, violacea,	Manella, ..	white and violet.	

Vanilla.

A climbing Orchid, not unlike the plant *Hoya*, should be trained up a tall post or tree, or over trellis.

No	Name.	Country.	Colour of flowers.	Remarks.
* 1	Van: aphylla. .	Java, ..	green and violet.	
* 2	,, aromatica .	Brazil,		
* 3	,, albida, ...	Java, .	green and white.	
4	,, bicolor, ...	Demerara, .	dull red and cream.	
* 5	,, claviculata, ..	Jamaica, .	white.	
6	,, grandiflora, ..	Guayana,		
7	,, insidora.			
8	,, Palmarum,	Bahia.		
†*9	,, planifolia, ..	West Indies,	yellowish white.	
10	,, pompona, ...	Mexico.		
11	,, sativa,	,,		
12	,, sylvestris, .	,,		

Warrœa.

Grows in the deep virgin forests of America, peat cultivation required and shade, turfy heath soil with a little silver sand; roots should never be exposed and plenty of water must be given whilst growing.

No.	Name.	Country.	Colour of flowers.	Remar
1	Warrœa bidentata,	N. Grenada,	cream and purple.	
2	„ candida,	Bahia, ..	white and purple.	
3	„ cyanea, ..	Columbia, ..	pure blue and white.	
4	„ discolor, ..	Costà Rica,	lemon and purple.	
5	„ tricolor, ...	Brazil, ..	white and yellow.	
6	„ Wailisiana,	„	cream and violet.	

† *Warscewitzella discolor.*

A Tropical American terrestrial Orchid, near *Warrœa,* flowers large and showy.

Zeuxine.

A small terrestrial Orchid, near *Neottia.*

No.	Name.	Country.	Colour of flowers.	Remarks.
1	*Zeux.* emarginata,	Ceylon, ...	white and yellow.	
2	„ goodyeroides, ..	Assam, ...	pink and white.	
3	„ integerrima, ..	Java.		
4	„ membranacea, ...	Bhotan, ..	white.	
* 5	„ sulcata, ..	Bengal, ..	white.	

Zosterostylus.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Zoster : arachnites,	Java.		
2	,, Zeylanica, .	Ceylon.		

Zygopetalum.

A Terrestrial Orchid, evergreen, hardy, grow in pots with peat soil.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Zygo : Africanum,	Sierra Leone,	green-yellow and white.	
2	,, brachypetalum,	Brazil, ..	brown and violet	
3	,, cochleare,	.. ..	pale green.	
4	,, crinitum cœrulea	Brazil.	green white and blue.	
5	,, intermedium,	do, ...	green and blue.	
* 6	,, Mackayii, .	do.	green-brown and lilac.	
* 7	,, Maxillare, ..	do, .	green chocolate and blue	
8	,, Murrayanum, .	do, ..	green yellow purple & red	
9	,, rostratum ..	Demerara, ..	yellowish green & pink.	
10	,, stenochilum.			

Zygostates

A small South American Epiphytal Orchid.

SUPPLEMENTARY NOTES.

Since the publication of the last number of the Society's Journal several questions have been raised concerning points in the general management of Orchids which do not appear to have been sufficiently noticed in the directions at the head of this paper. Without doubt, when properly managed, the choicer kinds of exotic Orchids will flourish best in a glass conservatory, but for most species a house of far simpler construction will answer admirably.

The light which Orchids most enjoy is that to which they are accustomed in nature when growing on the branches of trees—sunlight broken by the overhanging foliage—this is well imitated by a light shed of bamboo, entirely closed in with dried *ooloo* grass, somewhat as a *cuscus tattie* is made, only sufficiently thin to admit the sun and rain. In the hot weather it should be kept closed and the *outside* watered three times a day; the Orchids may thus be kept comparatively cool even on the hottest days. In the rains however, when the greatest danger is to be apprehended from too much moisture, it will be necessary to prop up the sides of the house, so that they shall still afford shade, and at the same time admit of a free circulation of air amongst the plants.

A house of this description may be erected for a very small sum. Mine is 30 feet long by 15 feet broad and cost with double bamboo "michâns" only about Rs. 25 0 0, and I have kept some of the most delicate Brazilian Orchids in it through the past hot season (1867) with perfect success. The floor of the house should be well rolled and care should be taken that there is no shelter near for that most destructive pest the great cricket, *Gryllotalpa vulgaris?* No orchid will escape from its depredations if there be the least protection for him, such as loose stones, kunkah, or bricks, either on the garden path or floor of the Orchid house, and I am not aware that any method has been devised of preventing the wholesale destruction of young shoots and flower buds, by these insects. I have tried tobacco juice, and ammonia, without the slightest effect, the only plan, when mischief has been done in the night, is to search everywhere for the pest and destroy him; he will often be found in the jammah on the Orchid pot itself. To prevent their taking up their abode in the gumlahs, it is well to cover the large pieces of jammah with a layer of half an inch of small pieces and over that a little moss or chopped cocoanut fibre. So long as any damage is being done, no stone should be left unturned until the villain has been destroyed

Orchids require a certain amount of shade when making their new growth but when the fresh stems or bulbs are nearly completed, it is very desirable that the plant should have more sun to ripen them: a couple of hours of morning sun is sometimes all that is necessary to make some orchids flower profusely, but during such treatment less water should be given. *Vandas*, *Renantheras*, *Dendrobes*, *Cattleyas*, *Lælias &c. &c.*, all require sun in moderation particularly when at rest; some of them such as *Renanthera coccinea* and *Vanda teres*, will bear full exposure during the whole of the cold weather.

The best season for importing Orchids from England is decidedly the months of July and August, after the extreme heat has passed. The plants should be kept in a dry verandah and watered most sparingly until the new growth has become strong and vigorous when they may be placed with the established plants in the Orchid House.

Never despair of a newly imported Orchid if it seems to be weak or sickly; even if it seems to be hopelessly gone, put it aside on a bed of damp moss, in a dark corner of the house, and the chances are signs of life will appear before long; it is worth the attempt even if only one or two out of a number of sickly specimens are saved; when strong enough they may be potted or bound to blocks like the rest.

THE GARDENER'S NOTE BOOK, No. 9.

On the management of Achimines in Bengal. By Mr. R. ERRINGTON.—*Head Gardener of the Society.*

To grow *Achimines* well, they require re-potting each season, in fresh soil, say April or May.

A couple of weeks before potting, give the old pots two good waterings, and allow to remain until a young growth appears; by this method few are lost; if potted, without starting to growth, there is risk of losing many. They should be put in clean pots, one half well drained, over the drainage a little chopped dry grass to keep the drainage perfect; the soil should be rich and light, composed of one half well decomposed vegetable matter, the other half common garden soil, adding a handful of sand, and well mixed together; place the roots near the surface, and one inch apart in the pots; it is much better to pot at first in small pots say, 4½-inch or 7½-inch pots, and give one watering to settle the soil, only damping the surface afterwards until a good growth is established: as the growth increases, water more freely. When either of these two sizes of pots get well filled, give them a shift to a size larger pot, *viz.*, 4½-inch to a 7½-inch, and 7½-inch to a 9-inch pot; shallow pots are best suited, as depth is not required. They must be well protected from the sun;

for this purpose a house similar to the beetel houses are best suited; but after the rains commence, a house where the upper covering could be removed at night, would be much better, removing the cover at 5 P. M. and placing it on again at 6 A. M. When the young plants attain a height of 6-inch, each shoot should be tied to a small thin stake, having the lower end well pointed so as not to injure the roots.

At this stage of the growth little else is required beyond careful watering, taking care that they do not suffer from drought, which causes the lower leaves to die off, and makes them very unsightly. A few weeks after blooming the foliage begins to decay; they should then be removed to a dry shed where rain cannot fall on them, and gradually withhold water, until all foliage is decayed, when the dead stems may be cut away and the roots kept perfectly dry until the growing season again arrives.

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JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Note on Dendrobium Calceolaria, Hook.—By DR T. ANDERSON *Superintendent of the Royal Botanical Gardens, Calcutta.*

THE plant exhibited by Mr. Jennings at the May meeting under the name *Dendrobium Calceolum** is not that plant but is the *D. Calceolaria, Hooker*. *Dendrobium Calceolum*, a very different plant, was first described and named by Roxburgh in the Flora Indica III. p. 488. from a plant he received from Amboyna. This however is not the plant cultivated in Calcutta sometimes as *D. Calceolum* but more generally, but wrongly, as *D. Dalhousieanum* Mr. Jenning's plant, the *D Calceolaria*, Hook. Exot. Bot. III tab 184. was first sent to England by Dr. Carey under the name *Cymbidium Calceolaria* and was described, figured and properly referred to Dendrobium by Sir William Hooker in the work I have quoted. He at the same time showed how much Dr Carey's plant differed from the rare and little known *D. Calceolum* of Roxburgh. Roxburgh's *D. Calceolum* is now known to botanists as *D. Rox-*

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* Mr Jennings states that the incorrect name of *D. Calceolum* was not placed upon the plant by him, as he was quite aware that it was the Dendrobe heretofore known, and incorrectly, as *D. Dalhousieanum*.—EDS.

burghii Griff. See Calcutta Journal of Natural History V. p. 370. Dr. Roxburgh's original drawing of it is in the Library of the Botanical Gardens.

Dendrobium Dalhousieanum, Paxt. Mag. of Botany XI tbl 145; was first introduced into England from the Botanical Gardens Calcutta.

Dr. Wallich, who first named this species *D. Dalhousieanum* without describing it, received the plant from the Countess of Dalhousie in 1829. In Dr. Wallich's Manuscript Catalogue of the plants in the Botanical Gardens, the native country is doubtfully stated as Brazil.

Mr. Griffith afterwards discovered the plant in the Tenasserim provinces near Mergui.

The true plant seems to have been lost in the Botanical Gardens many years ago and for the last 16 years *D. Calceolaria*, Hook. has been cultivated in the garden as *D. Dalhousieanum.*

Through the kindness of the Revd. C. Parish, Chaplain of Moulmein, I obtained last year a fine plant of *D. Dalhousieanum* and this year the plant flowered abundantly.

D. Moschatum, Wall. figured in the Botanical Magazine tab. 1837 is a very different species from these three. It is rather common in cultivation in Calcutta and is generally correctly named. I append an enumeration of the four species.

DENDROBIUM,

Sect. APORUM.

D. Roxburghii, Griff. Cal. J. N. H. V. p. 370.—*D. Calceolum*, Roxb. Fl. Ind. III. p. 370.

Hab. New Guinea, Amboyna.

Sect. HOLOCHRYSA.

D. Calceolaria Hook. Exot. Fl. III. tab. 184; formerly improperly named *D. Dalhousieanum* in the Royal Botanical Gardens, Calcutta.

Hab. On trees in hot valleys in Sikkim, Nepal, Eastern Bhotan, Khasia Hills, and Assam.

D. moschatum, Wall. Pl. As. Rar II. p. 83, Bot. Mag. t. 3837.

Hab. Nepal, Sikkim, Assam, Khasia Hills.

Sect. STACHYOBIUM.

D. Dalhousieanum, Paxt. Mag. Bot. XI. p. 145.

Hab. Tenasserim Provinces near Morgui.

Notes on the foundation of the Royal Botanical Gardens Calcutta.—By T. ANDERSON, M. D *F. L. S. Superintendent of the Gardens.*

THERE seems to be some misapprehension about the origin of the Botanical Gardens of Calcutta, and especially concerning the manner in which Government acquired possession of the ground for the garden. The early history of the garden, and the correspondence which took place at the time of its formation are fully preserved in the records deposited in the Garden Library. It appears to me to be very desirable to put these documents on record, as they are in manuscript, and in a bad state of preservation. I have accordingly had a faithful copy made of all the papers in my possession which refer to the foundation of the Botanical Gardens; and which I now have the pleasure to lay before the Society as an appendix to these remarks.

The suggestion to form a garden for the cultivation of spice trees, such as cinnamon, cloves and nutmegs, was first made to Government on the 1st June 1786 by Colonel Robert Kyd. The proposition was favourably entertained by the Governor General and it was forwarded on the 16th June of the same year to the Supreme Board, with a strong recommendation that Colonel Kyd's suggestion should be adopted. The Governor General himself offered to look out for a site for the Garden and to submit a plan to the Board for carrying on the scheme. On the 21st August 1786, the Governor General addressed the Court of Directors on the subject and stated in his letter that "they" (the Government) "are impressed with the conviction of the practicability of bringing this plan to maturity without incurring any considerable expence, and shall take the most effectual measures to this end as soon as a suitable place is selected, and the Governor General shall have had leisure to furnish the plan he proposes for carrying it into execution." The Court of Directors replied to this letter on the 31st July 1787, and sanctioned the establishment of a "Botanical Garden." Referring to the estimated expenditure of Rs. 200 a month the Court of Directors remarked as follows: "But so sensible are we of the vast importance of the objects in view, that it is by no means our intention to restrict you in point of expence in pursuit of it." However the Governor General had, three days before the date of this letter (*viz.* on the 27th July) written to the Court of Directors announcing the commencement of the Botanical Garden. The letter runs thus. "The intended establishment of a Botanical Garden was noticed to you last year; a proper spot of ground having been selected for it by Colonel Kyd in the vicinage of Calcutta and a mode adopted of satisfying the possessors (who had no other title than possession to produce giving them a right of tenure,) the undertaking has since been in progress." Colonel Kyd performed the duties of Honorary Superintendent of the Garden until his death in 1793. Many of his letters on the introduction of Teak and of Bread fruit, Cocoanut trees &c. into the Northern Circars, as means of supplying food in the times of famine, exist among the records of this Garden. After Colonel Kyd's death in 1793 Dr. Roxburgh, who was styled Company's Botanist at Madras, was appointed the first salaried Superintendent of this garden. The date of his appointment was 29th November

1793. Colonel Kyd did not reside in the Botanical Gardens. As the grounds around his house on the river bank immediately above Bishop's College were then separated from the Botanical Garden only by a ditch, the want of a residence in the Botanical Garden was not felt. However Dr. Roxburgh on the 15th August 1794, recieved permission to build a house of three stories (the one I now occupy,) in the Botanical Gardens at a cost of Sicca Rupees 15,000. Dr. Roxburgh explained that he was solicitous to build a house with three stories because it was his "wish to reside constantly in the Botanic Garden even during the rains." The house was not completed until after the end of November 1795, as on the 19th November Dr. Roxburgh applied for an additional grant of Rs. 5,000 to enable him to finish the building. This application was refused by Government.

I have endeavoured to discover the site of Colonel Kyd's Garden, referred to by Dr. Roxburgh in the 2nd volume of the "Flora Indica" page 629. It is currently reported that Colonel Kyd built the house on the river bank, which I have already referred to, and the grounds around that house, extending westwards to the eastern boundary of Bishop's College, seem to have been Colonel Kyd's private garden. These grounds are known as Kyd's Garden, Royd's Garden, (Sir John Royd Judge of the Supreme Court to whom Roxburgh dedicated his genus of capparidaceæ *Roydsia suaveolens*,) Barwell's garden, and in 1819 I find it styled Metcalfe's Garden. The land on which Colonel Kyd is supposed to have built the Shalimar house belongs to the Zemindars called the Seebpore Chowdries. The land is held from them on a perpetual lease, (Mowraseepottah) said to be drawn up in Colonel Kyd's name, and this lease is now in the possession of the widow of Rajah Kissennath, near Moorshedabad. Until 1820 this garden of Shalimar, which I believe was Colonel Kyd's private garden, was separated from the Botanical Gardens merely by a ditch, crossed by a masonry bridge over which was brought a pucca road which ran in a continuous line on a bund from the Shalimar house, into what was then part of the Botanical Garden. This road and bridge still exist.

In 1820 the Government made a gift of the eastern part of the Botanical Gardens, to the Lord Bishop of Calcutta as a site for the College, and it is from the correspondence concerning the transfer of this land, that I have ascertained that the Botanical Garden, and the garden attached to Shalimar house ("Mr. Metcalfe's garden" it is styled in the correspondence,) adjoined each other. The records in my Office confirm the statement that the gardens were continuous. There are no grounds to believe that Colonel Kyd ever possessed any part of the Botanical Gardens. Dr. Carey's remark in the introduction to the *Hortus Bengalensis* of Dr. Roxburgh, page II, published under Dr. Carey's superintendence, during the absence of Dr. Roxburgh in Europe, that the Botanical Garden was begun by Colonel Kyd in March 1786, is inaccurate, as the correspondence now printed for the first time, shews; and so apparently is the foot note at page II of the same introduction, in which Dr. Carey states, "that part of it had been previously cultivated as a Garden by Colonel Kyd, but it was augmented, and became a public establishment, at the time above mentioned." The error in this note probably arose from Colonel Kyd's garden and the Botanical Garden being continuous with each other along the river, and from the introduction having been written during Dr. Roxburgh's absence, and indeed only a month or two before his death.

Minute of the Governor General.

I have great pleasure in laying before the Board the accompanying letter and memorandum from Colonel Kyd.

The Establishment of a Botanical Garden as a Nursery for rearing and propagating for the public benefit the productions of other countries and climates, and such as may be equally conducive to increase the commerce and improve the culture of these Provinces, is an Institution I have long had at heart and to forward which the Board are I know perfectly disposed. The late Governor General was a great encourager of the introduction of new articles of commerce and foreign production into these Provinces and I regretted very much that the state of the Company's finances prevented our purchase for them of his garden, in which these plants were reared. If agreeable to the Board, I will look-out for a spot in a proper situation where a Garden may be formed, as a General Plantation or Nursery where the cultivation of the Cinnamon, and the different articles mentioned by Colonel Kyd, may be attempted. It will be necessary to prevent much expence in either establishing or carrying through this Institution. If the Board approve of the design, I could lay before them a plan which in carrying on this business will secure the Company against much or any unnecessary expence.

(Sd.) J. M.
(SIR JOHN MACPHERSON,
Governor General.)

HONORABLE SIR, AND SIRS,

In the course of last month, I did myself the honor of communicating to you some thoughts that occurred to me on the means of lessening or preventing a calamity to which this Country has been some time subject. Whether what I presumed to offer to the Board's consideration, has yet come under their notice or appeared to merit it, I know not; but the subject on which I now propose to address you, though widely different in its nature, it has occurred to me, may not appear less important to you on account of its immediate relation to the great national object of our conquests in India in the extension of its commerce.

About ten years ago, while I was on an excursion to our Eastern Frontier in search of health, and rambling through the woods which surround the garden at Fizgong in company with a friend, we stumbled on a tree the unusual foliage of which attracted our notice, and on application to the bark immediately discovered itself to be, or partake of, the Cinnamon species. On relating the circumstance to the Resident, we found that this tree was not indigenous to the soil, nor was it to be found any where else in the neighbourhood; we also observed that it had not propagated, but stood alone, and had so far attracted the notice of the natives that they ascertained its leaves to be the same as the aromatic leaf, known by the name of *Tage Paat* a spice universally used in Indian Cookery, and generally imported from Assam. By the assistance of the late Captain Cowe who then commanded at Dacca, I procured from the borders of the province of Assam some of the plants of the tree in question, one or more of which plants were deposited in the late Governor General's Gardens. This led to further enquiry, and the tree was found to be the Cassia or true Cinnamon tree, but presumed of an inferior species. It was also found to be a native of the Bootan Mountains, from which Country the Governor General likewise obtained some other specimens, in a year or two following.

Much about this time I believe, Captain Price the present Marine Pay Master, but then in command of the Bengal squadron, employed in the blockade and reduction of Pondicherry, took the opportunity when touching at Colombo to bring from thence some plants of the true Cinnamon tree, foreseeing the possibility of its cultivation in our Provinces. These added to the stock in the Governor General's Gardens, I can aver that both trees have with very little attention thriven in an uncommon degree, and that last December when I was about to leave Bengal, the Ceylon species had actually given fruit, and I saw a rising plantation of not less than 8 or 10 young trees.

The East India Company, I believe, have been often jealous of the benefits accruing to the Dutch from their possession of the Island of Ceylon. If this arises principally from its production of Cinnamon, the Board may inform them that this very valuable tree now begins to flourish in Bengal from the stock procured about 5 years ago from this very Island. Not expecting that this tree would have blossomed last year, I missed the opportunity of taking a drawing of it, but enclosed is a sketch from nature, of the fruit not quite ripe, at which period it assumes a different form and acquires nearly a purple colour resembling the fruit of the Coffee shrub. It was just beginning to blossom when I left Bengal in December last, but too imperfectly expanded to delineate distinctly the sexual parts which are in themselves very minute.

I have likewise the honor to enclose a drawing taken hastily, shewing the disposition and hanging of the tree and its branches. A scale is wanted, but it may be estimated at 16 or 17 feet. I have further to add that the trees of the same class supposed to be Cassia brought from the borders of Assam, and which on the most authentic intelligence, I can inform the Board flourish in the greatest abundance in a state of nature all over the skirts of the Sylhet Province, is in taste, flavour, smell of its leaves and bark, the same as that from Ceylon. It has not yet given fruit so as completely to ascertain its quality, but from what I have said it will be obvious to the Board, that with the smallest encouragement from the Court of Directors, they may in the course of five years have a plantation of the Cinnamon tree as extensive as they choose, from our now actually holding in possession the means of effecting it, free from all visionary and systematic suppositions.

I have been induced to throw out these communications, in hopes of its being the means of awakening the nation at large to a sense of the inestimable treasures which we already hold in our extensive dominions in this part of Asia and if possible divert the administration not only from thinking of making further acquisitions by new settlements, (but in as much as they may prove absolutely necessary for the preservation and security of what we already hold,) but also to embrace the opportunity of peace to reject such unprofitable parts of our empire as have only proved useless burthens to our more valuable possessions, and that it may also point out the small degree of encouragement only requisite to be afforded to the efforts made by private industry to enable us to outstrip our rivals in every valuable production which nature has confined to this part of the globe and has showered down with so bountiful and partial a hand over our possessions and which, if attended to, cannot fail to prove a further source of riches to Great Britain.

I also do myself the honor of enclosing a drawing of the long and black pepper plants both of which species, I can inform the Board, rise to maturity and give fruit in perfection, although reared in the vicinity of the Presidency, and under a very imperfect knowledge of the requisite mode of cultivation.

I shall not presume to intrude any thing further on the subject, resting assured the Board will foresee the inferences to be drawn from such a communication in a juster manner and in their most remote consequences than any thing I have to offer.

But I take this opportunity of suggesting to the Board the propriety of establishing a Botanical Garden, not for the purpose of collecting rare plants (although they also have their use) as things of mere curiosity or furnishing articles for the gratification of luxury, but for establishing a stock for the disseminating such articles as may prove beneficial to the inhabitants, as well as natives of Great Britain; and ultimately may tend to the extension of the national commerce and riches; and this I conceive can be best effected by Government procuring from the different parts of India and establishing a nursery stock, from which private individuals may be supplied gratis who may think themselves qualified to adventure on a general cultivation of the innumerable articles which our possessions will furnish the means of raising with success; of which I shall beg leave to suggest the enclosed very imperfect enumeration.

And I have to add that the charges attending such an Institution ought not I conceive to exceed 150 or 200 Rs. per month under the great influence and assistance, which this Government is capable of affording it *

With respect, I have the honor to be,
Hon'ble Sir and Sirs,
Your most obt. humble Servt.
(Sd.) ROBT. KYD.

N B.—The accompanying drawings to be preserved from up or moisture, in order to retain the colouring in its sent state

Dacca Cotton.

That species of cotton whose fibre is of so delicate a texture as to enable the manufacturers at Dacca to furnish the celebrated muslin of a superior quality to that which is produced in any other part of the world. This cotton is only cultivated in the neighbourhood of Dacca, and in such annual quantities as the demands of the manufactories of that place require.

Since the conclusion of the last war the foreign ships have carried home cotton indiscriminately collected. It is supposed this cotton peculiar to the vicinage of Dacca would be eagerly sought after by the manufactories in Great Britain.

Indigo.

This article has been successfully cultivated time immemorial in the neighbourhood of Corringa from a plant of a different species from that employed in the many rising manufactories of this article now in Bengal. In March last I brought some live plants together with a specimen of the soil in which they are most successfully cultivated and deposited them in the plantation of Sooksagur, where I understand they now thrive.

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* The Government for many years allowed the Garden to be cultivated by convict labour, and transmitted plants to it by their ships free of charge.—T. A.

Cherah Root.

The famed red Dye employed by the manufacturers on the coast in staining cotton clothes is extracted from this root of which I brought some live plants, together with a specimen of the soil adapted to their cultivation. The environs of Mussulapatnam have the reputation of furnishing this plant in its greatest perfection and from thence the specimen was obtained which I deposited at Sooksagur.

Sarsaparilla. Epecacuhana.

These Medicinal plants have been discovered by the French Jesuits growing in a state of nature near to Yanam—whether the true or bastard species I know not, but was informed by the gentlemen of the Factory at Ingeram, that the French had sent quantities of it to Europe in late years. Specimens of these articles I brought from Coringa, and they now thrive perfectly in Bengal.

Tobacco.

A species of this Aromatic is raised in the Northern Circars, and supposed of a quality equal, if not superior to that produced in America. Of the propriety of cultivating this for the Europe Market the Court of Directors themselves will be enabled to decide from a Bale embarked on the Danish ship " Count Bernstorff" which will be delivered by Mr. Hoar, the second in Council at Narsapoor, to the Court of Directors in the course of the present season. But we much want a plant of the high flavored Persian Tobacco brought us from Bussorah, which in fragrance exceeds that produced in any other part of the world; also a native practised in the cultivation.

Coffee.

This plant flourishes in the greatest luxuriance in the neighbourhood of the Presidency, and is very productive in fruit; but we want some plants of the best species from Mocca with a native of that country to shew the method of cultivating this valuable article.

Sandal or Saunders Wood.

This tree was first discovered by our officer growing on the banks of the Jumna in great luxuriance. It has been since found so low down as Buxar by Mr. Bruce the present Surgeon at Lucknow; and I was informed by Major Hawkins, late of the cavalry, that some trees of it had been discovered growing wild near Midnapore. It is likewise found in the Cashaar* country adjoining to our province of Sylhet. A detachment of our army in 1761, in their attempt to cross this country, found a house belonging to the Rajah constructed with this wood.

Lack and Lack dye.

This article is generally imported from Assam and that neighbourhood; it is also procured (but in smaller quantities) from our western Frontier, Pacheet and Ramgur, where the tree which affords nourishment to the Insect which deposits this Gum on its branches grows in a state of nature, but is no where cultivated.

Muggadooty.

This article was formerly brought only from the Assam country, but of late years has been discovered in our western Frontier, and no inconsiderable quantity of the same kind of cloth manufactured. The Trees which afford nourishment to the Insect producing these two valuable articles merit general cultivation.

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* *Sic in orig.*—T. A.

Gummatty, Teak Wood, Poon Wood.

About ten years ago some seed of the Java species of Teak being obtained, were raised in the Sooksagur plantation, and under very discouraging circumstances have thriven so well as to afford a rising plantation from the seed ; but the Timber obtained from the Rajahmundry Mountains is of a far more durable and valuable quality. Some specimens of this kind are wanting for general dissemination. The *Poon* species of Timber are procurable from Pegu and the Malay Islands. *Gummatty*: The Bark of this tree is said to furnish a species of cordage more valuable and durable than any thing of the kind we possess in Europe or Asia. It grows at Achem and probably through the extent of the Malay Peninsula.

Pepper and Cardamum.

Wanted some plants of the best kind from the Malabar and Malay coast with a Native skilled in the cultivation of these articles.

Gum Copal, Assafetida, Gum Myrrh, Gum Benjamin, and Camphor

The first of these articles is generally brought from Mocca and Juddah. It is known by the Natives in India by the name of *Carpah;* by the Europeans *False Amber.* I have termed this species of gum, *Gum Copal* from the very elegant varnish it furnishes, more in conjecture than certain information. *Assafetida and Gum Myrrh.* The value of these articles is sufficiently known to require being further noticed. The other two articles are generally brought us from the Malay Peninsula; specimens of the Trees furnishing them to be obtained from our Resident at Mocca, Acheen, and settlement under Captain Light.

China Lacker.

The tree furnishing this valuable article is said to be produced in the Siam country. Captain Wright of the ——

private Ship brought last year from this quarter some live specimens of the *Benjamin, Marianna* and some other valuable Fruit trees, influenced alone by private solicitation, and landed them here in very good condition, as I understand; but they perished from falling into negligent hands. A requisition on the part of Government, with a few instructions for their guide, will scarce fail to induce officers commanding trading ships to procure these articles.

Nutmeg and Clove.

These articles are to be procured through the means of our Residents on the Island of Sumatra.

Tea—Green and Bohea.

These plants to be obtained from our Factors established in China, with a native practised in the cultivation and preparing the leaf of this plant for use.

Extract from a Public General Letter to the Honorable the Court of Directors dated the 21st. August 1786 : paragraphs 50 to 53.

Per Severn Packet and Ranger 21st. August & 11th. September 1786

50. We forward to you a separate number in this packet, copy of a Minute recorded by the Governor General introducing a letter from Lieutenant Colonel Kyd, proposing the establishment of a Botanical Garden as a Nursery for rearing and propagating for public benefit the productions of other Countries, as a means of increasing the articles of commerce, and improving the culture of these provinces.

51 We beg leave to refer you to the letter itself for a fuller information of the Colonel's expectations and the grounds upon which he has formed them. We are impressed with a conviction of the practicability of bringing this plan to maturity, without incurring any considerable expence, and shall take the most effectual measures to this end as soon as a suitable place is selected and the Governor

General shall have had leisure to furnish the plan he proposes for carrying it into execution.

52. The cultivation of the Cinnamon and Pepper seems practicable, and we are sanguine in our expectations of greatly improving the Indigo plant, as well as of introducing the Date and Sago Trees. These may prove of infinite service to this Country should it ever experience a failure in the crops.

53. The drawings of plants alluded to will be put into the letter Packet by the " Ranger" that they may reach you in good preservation.

Extract from a Public General Letter to the Honorable the Court of Directors dated 27th. July 1787, paragraphs 114 and 115.

Cons: 21st, May 1787, Botl Garden.

114. The intended Establishment of a Botanical Garden was noticed to you last year. A proper spot of ground having been selected for it by Colonel Kyd in the Vicinage of Calcutta, and a mode adopted of satisfying the possessors (who had no other Title than possession to produce giving them a right of Tenure) the undertaking has since been in progress It is attended with very little expence to the Company under the present Management and holds out a flattering prospect of rearing by care and attention in Bengal the valuable productions of all parts of India. To this end we have made application to your different Presidencies and through them to more distant places for sundry Plants, Trees &c. suggested by Colonel Kyd, and we beg leave to extend this application to you as we are persuaded from an experiment made by Captain Cumming of the "Brittanica" who brought a great variety in good condition to Bengal, that it may be effected at a very trifling expence.

Cons. 12th, March

Cons. 18th. May

Cons. 18th. May. 115. On this subject we beg leave to refer to your particular attention a letter from Colonel Kyd, and a list of the different Plants that he wishes to have sent out which are forwarded in a separate number in the packet.

Per Ship Ravensworth 27th, July 1787.

Extract from a Public General Letter from the Honorable the Court of Directors dated 31*st. July* 1787.

39 /50 @53. We have received great pleasure from the perusal of Lieutenant Colonel Kyd's Letter referred to in these Paragraphs, proposing the Establishment of a Botanical Garden, and give our most hearty approbation to the Institution as the charges thereof are estimated at not more than 200 Rupees per month. The experiment respecting the Cinnamon Tree in particular, must be made in different parts and soils of those extensive Provinces, in order to ascertain with certainty, whether this Spice can be produced in Bengal equal to that which grows on the Island of Ceylon. We have likewise perused a former Letter from Lieutenant Colonel Kyd of the 13th. April 1786, relative to the Sago Tree, and its efficacy and importance in cases of Famine and Pestilence. We hope you will give this subject all the consideration that it may appear to merit. You must keep us constantly advised of the progress that may be made in the Botanical Garden and continue to send us drawings of such of its productions as you may deem worthy of our attention. We are aware, that by extending your experiments too far, the expense may increase to an amount of which you may not at present have any idea. The Establishment therefore must be confined in the manner pointed out by Colonel Kyd as mentioned in the last Paragraph, but one, of his letter of the 1st. of June last. But so sensible are we of the vast importance of the objects in view, that it is by no means our intention to restrict you in point of expense in the pursuit of it. In the cultivation of the Cinnamon Tree in particular we foresee a great source of wealth to the Company

and of population and opulence to the Provinces under your administration. Most earnestly therefore do we recommend it to you to proceed in your endeavours to propagate this Spice in different places, and that you avail yourselves of the abilities and zeal of Lieutenant Colonel Kyd herein and who, by the attention, he has shewn to a matter which may one day prove of the greatest benefit to his Constituents and to his Country, stands most deservedly high in our esteem and favor

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Notes on the Tapioca plant (Manihot utilissima, Pohl) as cultivated in the Malay Peninsula.

[Communicated by Albert C Maingay, M D. Acting Assistant Colonial Surgeon, Malacca.]

In the Agri. Horticultural Journal for 1850, at page 241, occurs an interesting account of the Tapioca plant as cultivated in Assam; and it is stated that up to that date no flowering specimens had been met with in India. Having been fortunate enough lately to meet with the plant both in flower and fruit, and finding that my observations supplement to some extent those already recorded in the Journal, as a quotation from the Botanical Magazine, I venture to submit them to the Society.

I find the perianth in the male flowers five-partite, subvalvate, cleft for a little more than half its length, externally glabrous, internally minutely and very sparingly pilose; its triangular ovate divisions obtuse or subacute at their apices. Stamens ten, the alternate ones longer and opposite the lobes of the perianth. Filaments inserted into the sinuses of a marginally ten-lobed, elevated, convex, yellow, fleshy glabrous disk. Anthers bilocular, slightly dorsifixed. Pollen grains very large, globose, bright yellow.

The female flowers are larger but of similar general character to the male, with the exception of the perianth, which

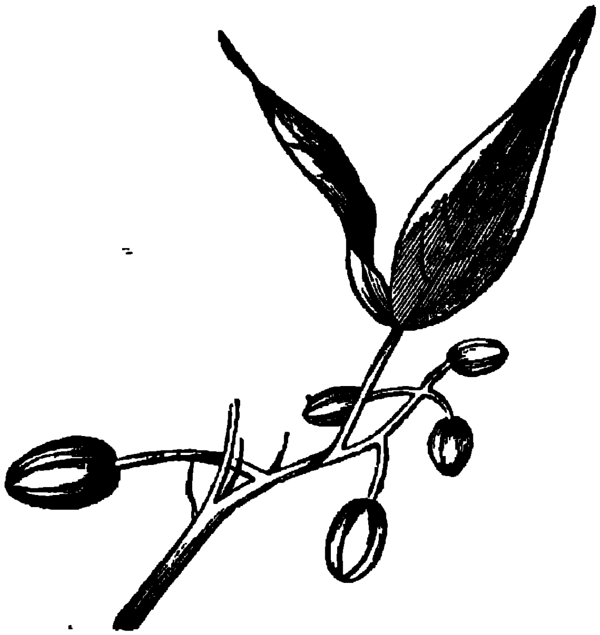

Fig. 1.

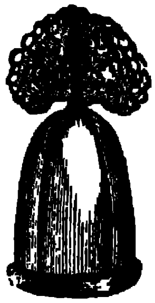

Fig. 2.

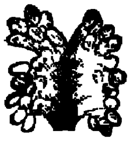

Fig. 3.

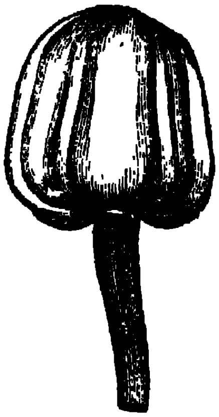

Fig. 4.

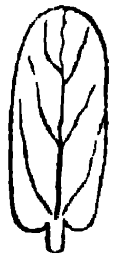

Fig. 5.

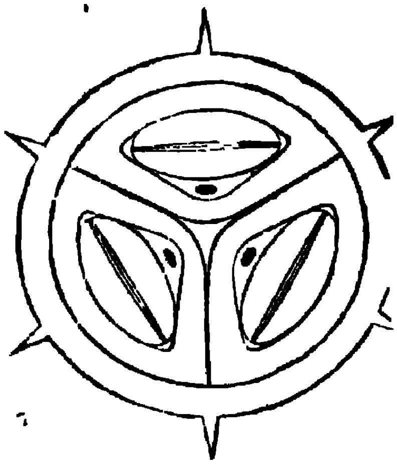

Fig. 6.

is cleft to the base. Ovary glabrous three-locular, each loculus containing one suspended ovule. Disk annular, entire, bright yellow, glabrous. Style fleshy, three lobed, each lobe shining white, flabellate, more or less deeply bifid, with the lateral halves in close opposition, their margins slightly undulate, and furnished with several series of short simple rounded stigmatic processes.

Ovules with a ventral raphe and inferior micropyle. Fruit about ¾ths of an inch in length, very slightly trigonous globoso-cylindrical, obtuse, glabrous, tricoccous, with six membranous alæ extending from its apex to its base. Cocci osseous, seed slightly trigonous, arillate. Arillus at the apex of the seed a fleshy heart-shaped caruncle, with a small dorsal lobe expanding below into a thin complete membranous investment. Testa cartilagineo-crustaceous, albumen copious. Embryo axile, cotyledons opposite, elliptical, white, slightly veined from their base. Radicle superior, short, cylindrical

Description of figures. Fig. 1. female flower, nat. size Fig. 2. ovary much enlarged. Fig 3 Flabellate lobe of stigma with stigmatic processes. Fig. 4 Fruit, natural size Fig 5 embryo, much enlarged. Fig 6. Transverse section of fruit enlarged to about twice the natural size

The Tapioca procured from this plant is of excellent quality and there is already in the Straits Settlements a very large and rapidly increasing area devoted to its cultivation

This branch of industry may be said to be almost entirely in the hands of the Chinese, who are rapidly clearing for it immense tracts of virgin forest. These they have hitherto received at the almost nominal sum of twenty-five cents per acre. This would be an admirable arrangement for the Government if the land so leased, were thus brought under permanent cultivation, but such is by no means the case, and herein lies the evil of the system; for tapioca utterly exhausts the soil after three or at most four crops. The

Chinese tenant, himself a man of capital, now no longer able to turn the soil to profitable account, is able to transfer the lease to some poorer Chinese, as a mere ruse to escape its responsibilities; and the latter either absconds or goes to jail for nonpayment of rent. The Government as the result has now thrown upon its hands, an utterly barren and unprofitable tract of country, quite denuded of the valuable timber which had previously given to it a small but permanent value.

It is obvious that so long as the Chinese can obtain virgin forest on such favourable terms, they will always endeavour to do so, to the exclusion of any other land.

The true remedy for this lies either in non-transferable leases being issued, or for shorter periods at largely increased rates, so as to recoup the Government for the future loss produced by the inevitable exhaustion of the soil, and consequent loss of revenue during the renewal of the forest. This latter, as far as I have been able to observe, does not take place under at least eighty years, after the ground has been once cleared and cultivated for four or five years. The first successive growths in an abandoned clearing belong to quite different classes from their predecessors. The original forest in the Straits is made up almost entirely of the gigantic Dipterocarpi or wood oil trees, of the genera *Dipterocarpus*, *Hopea*, *Shorea* and *Vateria*. Amongst these are scattered specimens of *Sindora* of three species; *Nitzschia Palembanica*, which here attains probably its most Western limit; *Boschia*; *Durio* of one or perhaps more species; *Cratoxylon*; *Garcinia*; *Bassia* and several other *Sapotaceæ*; *Xanthochymus*, *Mesua*, *Schima*, *Gordonia*, *Pterospermum*, *Tarrietia*; several representatives of the curious subgroups of *Sterculia*; very many species of *Burseraceæ*; two of *Styracaceæ*, both producing Benzoin of excellent quality; *Artocarpi*, including the anomalous species named by Miquel *Anisophylla*; and many *Fici*. The first growth in a clearing consists entirely of shrubs or small trees and climbers, and the ground is rapidly covered with a dense jungle of several small species of *Myrtaceæ* especially *Eugenia, Syzygium, Nelitris, Rhodamnia* and *Rhodophyllum*; together with *Morinda bracteata* and *umbellata; Adinandra; Eurya; Nephelia* of several varieties, *Cupania; Brownlowia* or a very closely allied genus; *Grewia paniculata* (Roxb.) in great abundance; *Arthrophyllum; Casearia; Embelia; Ardisia; Vitex arborea* a species affording a valuable timber called 'Lubbhun'; *Premna; Clerodendron; Celtis; Sponia; Rottlera* and *Mappa* of several species, including Miquel's *M. hypoleuca; Melastoma Malabathricum* and its many varieties, commonly called *Rhododendrons* in the Straits; together with prostrate or climbing species of *Uvaria, Rourea, Connarus, Dalbergia, Uncaria* and *Cissus*.

This vegetation in its turn gradually—perhaps in the course of from 10 to 15 years—gives place to a more permanent one of larger growth, though still far inferior to the original forest. The former small species of *Myrtaceæ* are supplanted by others of larger growth. Arboreous *Dialia* and *Gardeniæ* such as *Anisophylla*, Jack; together with tree *Anonaceæ* are now met with in varying abundance. The larger *Myristicaceæ*, including in the Malacca district both *Hookeriana* and *longifolia;* that most local tree, *Trigoniastrum hypoleucum*. Miq.; *Pavonia; Hibiscus* including the singularly fine form figured by Wallich as *H. vulpinus*, tab. 51; *Paritium;* many species of *Sterculia, Monoceros,* and *Elæocarpus; Photinia;* some of the smaller *Dipterocarpeæ* and *Guttiferæ;* a few *Meliaceæ; Sapotaceæ; Alstonia; Gomphia* and *Brackenridgea;* of *Ochnaceæ;* and *Lauraceæ*—amongst which may be specially noted two of the lamented Griffith's discoveries, *Lepidadenia Griffithii* and *Cryptocarya Griffithiana* (R. W.)—all occur more or less frequently. A few large *Euphorbiaceæ* will complete my list as regards this cycle of growth which I have supposed to last for about sixty years. *Connara-*

ceæ have during this period almost entirely disappeared and their place has been taken by plants delighting in deeper shade, including *Scitamineæ* of highly curious form; the rare plant described by Griffith as *Thottia grandiflora*, with large campanulate drooping flowers of a lurid purple; *Lepidagathis longifolia* (R. W. Ic.) one of the few representatives, comparatively speaking, of its order in the Peninsula; and above all gigantic *Calami* and *Zalaccæ* especially delighting in the oozy beds of small water-courses.

I imagine that at about the expiration of the period I have noted above, seedlings of species identical with those which formed the ancient forest, will again spring up, enter into competition with, and ultimately supplant those of smaller growth. For this, it will be necessary that a sufficient number of seed bearing individuals survive within a distance sufficiently close for their seeds to be readily disseminated by the agents at work for that purpose. I must guard myself against a possible misconstruction, by noting that the small trees and shrubs, which I have enumerated under what I have termed first and second cycles of growth, are by no means absolutely exterminated by the progress of what, for distinction, I may call the giant forest; but their numbers are so greatly diminished that they cease to form a conspicuous feature of the vegetation of the country. They nevertheless always maintain their ground in numbers sufficient to enable themselves, under more favourable circumstances, to multiply to an indefinite degree. In advancing these views I do so with very great diffidence, and more as a theory with a desire of drawing attention to a series of phenomena of curious interest, and which officers exclusively employed in the forest department may be better able to note than I am. Whilst it is well known that teak and sâl form extensive forests, I think their reappearance, except under a very long series of years, highly doubtful, if the tracts they now occupy were extensively cleared and brought under an exhausting cultivation for four or five years, their prostrate trunks having been in the meantime burned to aid in fertilising the ground.

I will now revert to the more immediate subject of this paper, trusting that the preceding observations will not be deemed altogether foreign to it.

Whilst opposing an indiscriminate clearing of forest on terms so unfavourable to the Government, there must be many extensive districts, especially in Assam, already cleared, from which, if prices are sufficiently remunerative, an abundant crop of tapioca might be obtained without interfering to more than a trifling degree with the ultimate renewal of the forest. I fear however the supply from the Straits will more than suffice to meet any demands of the home market. The method by which it is prepared on the large scale in the Malacca district is as follows.

The tubers, which weigh each on an average from 10 to 25 lbs, and to which they attain in from eighteen to twenty months, are first scraped and then carefully washed either by hand labour, or by being placed in a rotatory drum exposed to a stream of water, and by which all impurities are removed; after which they are reduced to pulp by being passed through rollers. This is carefully washed and shaken up with abundance of water until the farina separates and passes through a very fine sieve into a tub of water placed beneath. The flour so obtained undergoes eight or nine washings, as upon the care with which these are conducted, depend very much its whiteness and price in the market. It is now collected into large heaps, placed on mats, and bleached by exposure to the sun and air. It is finally converted into the pearl tapioca of commerce, by being placed in a cradle-shaped frame covered with canvass cloth, and in small quantities at a time, and slightly moistened, subjected to a rotatory movement, when the mass gradually forms into small globules, each about the size of a No. 6 shot. Whilst still soft, these are taken out and dried in the sun, and lastly, whilst constantly stirred, are fired in a large shallow iron pan, which is occasionally rubbed on the inside with vegetable tallow, after which they are packed in bags ready for exportation. I am indebted for a portion of the preceding details to Mr. A. DeWind, a gentleman who has had extensive practical experience

The Malays for their private use frequently prepare a spurious kind of vermicelli by adding a small quantity of water to the Tapioca flour and half boiling it to the consistence of paste, when it is forced through the bottom of a vessel perforated for the purpose, and the resulting filaments are then dried in the sun.

Whilst the details of these processes vary on different estates, it may not be uninteresting to quote here for the sake of comparison, the description of the method of preparing sago from the sago palm, as described by Forest, one of the early voyagers; and quoted by Pennant at Vol. IV page 195 of his quaint old work on the Spicy Islands, published in the year 1800, as follows: "The tree being "felled it is cut into lengths of about five or six feet; a part "of the hard wood is then sliced off, and the workman com-"ing to the pith, cuts across (generally with an adze made "of hard wood called a Neebong) the longitudinal fibres, "and the pith together, leaving a part at each end uncut, "so that, when it is excavated, there remains a trough, into "which the pulp is again put, mixed with water and beat "with a piece of wood; then the fibres, separated from the "pulp float at top and the flour subsides." The above process is precisely the one employed by the Malays at the present day in this district, but they cut down their Sago palms only on the rare occasions of the failure of their rice harvest.

There remains but one more point in the economy of the tapioca plant for notice, but it is one which, especially in its relation to vegetable physiology, is of considerable importance. It is the fact adduced by all classes of cultivators with whom I have conversed on the subject, that in planting from cuttings, they must on no account be inverted. If by an accident this occurs the resulting tubers do not belong to the variety described as the sweet, but to that to which in the West Indies I imagine the term "bitter cassava" has been applied. The effects produced by eating these without prolonged steeping and washing, are giddiness and vomiting, but as their taste is sufficiently bitter to act as a warning, such unpleasant results seldom occur. An interesting subject of enquiry is opened up, as to the result of alternately inverting and again reversing the cuttings for a succession of crops. With a view to test the accuracy of the popular belief, I have planted six cuttings in the usual manner and six inverted, but I fear my stay in my present appointment will not be sufficiently long to enable me to lay the results before the Society, but I take the liberty of commending a series of experiments to the notice of the Members

Though the "bitter cassava," a plant considered botanically identical with the present species, is highly poisonous unless exposed to heat, it may not be generally known in India that it forms the basis of the famous West Indian stew called "pepper pot," and that it also enters largely into the composition of several kinds of sauce.

Report on trial sowings of Flower-seeds from Messrs. JAMES CARTER *& Co. of London and Messrs.* VILMORIN ANDRIEUX *& Co. of Paris.—By* JOHN SCOTT *Esq., Curator of the Royal Botanic Gardens, Calcutta.*

I herewith enclose in a tabular form the report on the germination of Vilmorin, Andrieux & Co's collection of seeds, which you were good enough to send me for trial in the Botanic Gardens. The seeds were sown on the 16th November, and the majority of those enumerated in my report had germinated by the 1st of December I may state that a portion of each kind was sown in flower-pots, and the remaining portion in prepared sites in the flower-borders. It is almost superfluous to say that by "prepared sites" I simply mean the addition of vegetable mould and sand, which are most essential to the germination of nearly all the finer kinds of exotic flower seeds, in the relatively ungenial soil of the Gangetic delta. I am, indeed, inclined to attribute much of the disappointment in the flower seeds, imported by the Society, to the frequent neglect of such precautions by Indian floriculturists The careful and judicious watering of seeds cannot either be too strongly impressed; and this I the more especially notice, as I observe in that truly useful work of the Rev. T. A. C. Firminger on Indian gardening, a very injudicious system cited; and I may say, tacitly recommended. For details, I refer you to page 248 of the above work, and merely state that the mode is to sow the seeds, place them under water, and allow it to drain off. Theory and practice are alike opposed to such treatment; and the results would assuredly be the rotting of a very large percentage of the seeds under any circumstances, but of course greatly intensified when applied to seeds imported from Europe.

Illustrative of these points, or at least showing that the general treatment of the seeds is a source of disappointment paramount to that from deteriorated quality, I beg to enclose a report also on my success with the collection of annual flower seeds supplied by the Society from Messrs. Carter & Co. and of which I am told that members have made very unsatisfactory reports.

In the subjoined tabulations. I have arranged the results in four columns giving in each an approximate estimate of the percentage of seeds which have germinated: thus in column *one* the germination is from *one* to *six per cent.* in column *second* from *six* to *twenty*, and so on to *ninety per cent.*

I need scarcely add that the contracted terms opposite the names in the respective columns have reference simply to the relative degree of germination.

A cursory summary of the tables gives the following results: —of the collection from Messrs. Vilmorin, Andrieux & Co. *three* kinds only have entirely failed and of the remaining 47 kinds the average germination is 5 at 4·2 per cent; 5 at 14·2 per cent; 10 at 42·5 per cent, and 27 at 69·7 per cent.

In the collection of Messrs. J. Carter & Co. *six* kinds have wholly failed, and the average germination of the others, 58 in number, is 4 at 5·1 per cent, 13 at 29·3 per cent, 23 at 42·1 per cent, and 18 at 64·4 per cent. Thus the average germination of Vilmorin, Andrieux & Co's seeds is 50·8 per cent, that of Carter & Co's is 43·5 per cent, affording a difference of 7·3 in favor of the quality of the seeds from the first mentioned firm.

Such comparisons however as the present are faulty; inasmuch as the respective collections contain in many instances very different kinds of seeds, each of which has its own peculiar constitution involving greater or less facilities for modification and assimilation to changed conditions: affording very evident sources of error in the mere numerical comparisons, I have instituted. I have thought it right to allude to this, in case members might be disposed to regard my experiments as conclusively indicating a *real* superiority of the seeds from the French firm. In my opinion there is every reason to be satisfied with the results of both collections, and I may also add that the seeds received in the Botanic Gardens by direct order from the firm of Messrs. J. Carter & Co. have generally germinated well There is however one important advantage which continental grown seeds are likely to possess over those grown in Britain for cultivation here; viz. the attainment of a stage in acclimature sufficient to enable us to flower many plants, for which we are now dependent on previous acclimatization in Upper India.

Tabular statement of the germination of a collection of seeds from Messrs. James Carter and Co.,

			Approximate estimate of the seeds sown and the germination.			
			1 1-6 : 100	2 6-20 : 100	3 20-50 : 100	4 50-90 . 100
	1	Aquilegia,—choicest mixed, ...	None	have germinated.		
*	2	Larkspur,—dwarf-stock-flowered, ...	max.			
	3	Nigella,—finest mixed, ...	... ...	... ..	med	
	4	Poppy,—finest double, ...	... ..	.. ..	max.	
	5	Stock,—new large flowered, ...	... ..	... ...	max.	
	6	Wall flower,—finest mixed, ...	... ..	... ...	... ...	med.
	7	Mignonette, ...	... ...	... ...	... ...	min.
*	8	Heartsease,—extra choice, ...	... ...	.. ...	max.	
	9	Portulacca—splendid mixed, ...	... ...	... .	med.	
	10	Carnation,—extra choice, ...	... ...	... ...	med.	
	11	Cerastium Biebersteinii, ...	None	have germinated.		
*	12	Dianthus chinensis, ...	... ...	... ..	med.	
*	13	Saponaria calabrica,—mixed, ...	... ...	... ...	... ...	med.
	14	Sweet William—Auricula-eyed, ...	... ...	... ...	... ...	med.
	15	Viscaria nana coccinea, ...	... ...	... ...	... ...	med.
	16	Linum,—true scarlet,..	... ...	... ...	... ...	med.
	17	Balsam,—finest double, .. .	... ...	... ...	... ...	med.
	18	Nasturtion Tom Thumb var. .. .	... ...	... ...	med.	
	19	„ King of Tom Thumbs, ...	... ...	... ...	med.	
*	20	Tropæolum—new French hybrid, . ..	.. ...	... ...	med.	
*	21	Lupinus,—newest sorts, ...	.. ...	... ...	max.	

	22	Sweet pea—finest mixed,		max.		
	23	,, ,, ,,			med.	
	24	Clarkia integripetala—new var.			max.	
*	25	Godetia new Mexican, var.				min.
	26	Oenothera Lamarckiana,				max.
	27	Mesembryanthemum,—mixed,		med.		
*	28	Scabious,—finest German,				med.
	29	Acroclinium roseum,		med.		
	30	Aster,—new French varieties,	None	have	germinated.	
	31	Brachycome—finest mixed,	med			
*	32	Coreopsis—finest mixed,			max.	
	33	Chrysanthemum,—large flowered var.	None	have	germinated.	
	34	Dahlia—from named sorts			max.	
	35	Jacobœa,—finest mixed,	max.			
	36	Kaulfussia—new variety,			med.	
	37	Rhodanthe Manglesi,	None	have	germinated.	
	38	,, maculata,				min.
*	39	Tagetes patula,—finest mixed,		min.		
	40	Zinnia elegans,—splendid double,				med.
	41	Campanula pyramidalis,			med.	
*	42	Lobelia,—true crystal Palace variety,				med.
*	43	Nemophila,—finest mixed,		max.		
*	44	Whitlavia grandiflora,				max.
*	45	Collomia coccinea,			med.	
	46	Leptosiphon,—French hybrid,		med.		
	47	Phlox Drummondii—splendid mixed,			med.	
	48	Nolana—finest mixed,				max.
	49	Convolvulus major,—splendid mixed,		max.		
	50	,, tricolor—vars.,		med.		
	51	Myostis palustris,		med.		
*	52	Petunia—splendid mixed,			med.	

Tabular statement of the germination of a collection of seeds from Messrs. James Carter and Co,.

Approximate estimate of the seeds sown and the germination.

		1 1-6 : 100	2 6-20 : 100	3 20-50 : 100	4 50-90 : 100
53	Petunia Dunnett's—new hybrids,			mad.	
54	Artirrhinum—choicest mixed,			med.	
55	Linaria splendida,				med.
56	Nycterinia selaginoides,				med.
57	Salpiglossis,—finest mixed,—			max.	
58	Schizanthus grandiflorus oculatus,				med.
59	Veronica glauca—new,		med.		
60	Verbena,—newest hybrids,—		med.		
61	Lavender,		med.		
62	Perilla nankinensis,		med.		
63	Ricinus,—finest mixed,—	max.			
64	Tritoma uvaria grandiflora,	None	have germinated.		

Royal Botanic Gardens,
Calcutta :
15th, January, 1868.

John Scott,
Curator.

Tabular statement of the germination of a collection of seeds from Messrs. Vilmorin, Andrieux and Co.,

Approximate estimate of the seeds sown and the germination.

		1 1–6. 100	2 6–20 : 100	3 20–50 : 100	4 50–90 : 100
1	Delphinium Ajacis minus,				min.
2	Papaver Rhœas fl. pleno (Double var.				med.
3	„ Somniferum,				min.
4	Alyssum maritimum,				min.
5	Cheiranthus annuus,				med.
6	Iberis amara, var			med.	
7	Viola tricolor grandiflora,			max.	
8	Dianthus sinensis,				max.
9	Saponaria calabrica,				max.
10	Silene pendula ruberrima,				med.
11	Althœa rosea,		max.		
12	Malope grandiflora,				med
13	Impatiens Balsamina,				med.
14	Tropœolum Lobbianum Brilliante,				med.
15	Lupinus polyphyllus,			max.	
16	„ nanus,	max.			
17	„ Cruickshankii,			med	
18	Clarkia pulchella fl pleno,			max.	
19	Godetia rubicunda var. Schamiri,				min.
20	„ „				min.
21	Momordica charantia,	med.			
22	Centranthus macrosiphon,				max.
23	Scabiosa atropurpurea,		med.		

Tabular statement of the germination of a collection of seeds from Messrs. Vilmorin, Andrieux and Co.,

Approximate estimate of the seeds sown and the germination.

			1 1-6 : 100	2 6-20 : 100	3 20-50 : 100	4 50-90 : 100
	24	Cineraria hybrida,				min.
*	25	Coreopsis diversifolia,	max.			
	26	„ tinctoria				med.
	27	Machaeranthera tanacetifolia,	None	have germinated.		
*	28	Tagetes erecta var. fistulosa,				med.
	29	Xeranthemum annuum,		med.		
*	30	Lobelia erinus marmorata,			max.	
	31	Vinca rosea,	med.			
	32	Primula sinensis rosea,				min.
	33	„ „ fl. albo,			med.	
*	34	Whitlavia grandiflora,				max.
*	35	Nemophila insignis,			med.	
*	36	Collomia coccinea,				max.
	37	Fenzlia dianthiflora,				max.
*	38	Phlox Drummondii,		med.		
	39	Ipomœa limbata,				med.
	40	„ purpurea,			med.	
	41	Cynoglossum linifolium,			max.	
	42	Heliotropium var.	med.			
	43	Myosotis alpestris,	None	have germinated.		
*	44	Petunia hybrida,				min.

45	Calceolaria Youngi hybrida,			med.
46	Collinsia bicolor,		med.	
47	Mimulus speciosus,			max.
48	Perilla nankinensis,	None	have germinated.	
49	Gomphrena globosa violacea,			med.
50	Mirabilis Jalapa,			med.

ROYAL BOTANIC GARDENS,
CALCUTTA:
15*th*, *January*, 1868.

JOHN SCOTT,
Curator.

A List of the higher Cryptogams cultivated in the Royal Botanical Gardens, Calcutta. By John Scott, Curator.

In submitting the following enumeration of the higher Cryptogams cultivated in the Botanical Gardens here, I have thought that a few prefatory notes on the general treatment of these plants in Lower Bengal might not be out of place, as so far as I am aware, a very few species are in general cultivation; and these either cosmopolitans, or indigenous to this or countries of a somewhat similar climate. Thus of the nineteen species mentioned by the Rev. T. A. C. Firminger in his book on "Indian Gardening," as cultivated in the gardens about Calcutta eight species are indigenous, *viz; Hemionitis cordifolia*, Roxb., *Polypodium quercifolium*, Linn., *Polypodium proliferum*, Roxb., *Adiantum lunulatum* Burm. *Pteris amplectens* Wall.—*Pteris longifolia*, Linn., *Alsophila longifolia*, of Calcutta gardens—*Polypodium Irioides*, Poir., and the water Fern, *Ceratopteris thalictroides*, Brongn. *Nothoclæna piloselloides*—*Drymoglossum piloselloides*, Presl.—though abundant on the mossy trunks of trees in various parts of the Indian Peninsula is not found in the vicinity of Calcutta, and far from common in gardens: *Polypodium lanceolatum*.—*Acrostichum lanceolatum*, Hook.—a common Indian fern occuring alike in dry and in humid regions, and thus as might be expected thriving well in Calcutta gardens. The *Adiantum procerum*, mentioned by Firminger, as "met with in the Calcutta Botanic gardens" is unknown to me; *Adiantum formosum* a fern abundant about Port Jackson, Australia: *Pteris cretica* frequent in all tropical and temperate countries; *Onychium lucidum*, a north Indian species which requires only for its successful cultivation to be placed beyond the reach of stagnant water; so also with the *Lastrea cochleata*, *Aspidium squalens*—*Pteris serrulata* Linn.—and the more robust species of Davallia, which are occassionally seen in Calcutta gardens. The Lycopodiums or Club-mosses and the

Selaginellas are even more sparingly represented in Calcutta gardens than the ferns: and in the work above referred to one species only of the latter genus is noticed as a common plant in the gardens about Calcutta, and as growing vigorously in moist shady localities.*

That many other, indeed I believe all tropical and subextra-tropical species-ferns, may be successfully cultivated here is satisfactorily shown by the subjoined enumeration of the species now growing in the Botanic gardens. This collection contains species from most diverse natural habitats. Thus there are the thoroughly temperate species from elevations of from 7—9000ft, in the Himalayas, others from their humid tropical flanks and valleys; from the damp foggy declivities of the Khasya Hills, the equable and humid jungles of the Malayan Peninsula and Archipelago (whose species are in general perennially verdant) as also the hygrometric, and deciduous species from the drier parts of India. Varied though the habitats indicated are, there are characteristic fern representatives of all, in as vigorous health as could be seen in the fernenes of Europe—partly in a glass conservatory, and partly in those structures used by the natives of India for the cultivation of Betle-leaf—Piper Betle, L. The latter structures were first erected in the Botanic gardens in December 1865 for the cultivation of the Piperaceæ, Orchideæ and Ferns†

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* As showing the large increase in the number of species of the higher Cryptogams now cultivated in the Botanic Gardens, relatively to those cultivated prior to the application of the native Betle-houses I make the following quotations from previous records —

Roxbourgh's Hortus Bengalensis	40 sp.
Master's Cat of plants in the H C. B Gardens	24 sp
Voigt's Hortus Suburbanus Calcuttensis	53 sp.
Botanical Garden Catalogue,—T Anderson, 1865	50 sp
In the subjoined list	

† With reference to the application of the native Betle-houses to Orchid cultivation, I may state that the credit is wholly due to Dr. Anderson who suggested them to me, shortly after my appointment to the garden under his superintendence, as the only remaining hope for the successful management of Orchids in these parts of Bengal I the more especially note this, because I have frequently heard it accredited to gentlemen who have no right to it whatever.

to nearly all the representatives of which the climate of Lower Bengal is most ungenial.

For the two former orders the Betle-houses have proved most successful and are now generally adopted in the gardens about Calcutta for Orchid cultivation, to which they have naturally given a great stimulus, as prior to their introduction, the vast majority of Orchids were but introduced, perhaps flowered in the season of their arrival, and dead ere its annual return. What the Ward's case has done therefore for the plant-loving residents of the crowded city on the small scale, so on a large scale has the primitive native Betle-Houses done for the floriculturist in Lower Bengal: they are largely applicable, and will enable us to represent well, whole orders which had but a discreditable existence in the gardens previously. Ferns of many kinds may also be grown in these structures, but for a general collection of tropical species glass structures are absolutely necessary. Thus only can the extremes of a Bengal climate be properly modified for the requirements of ferns: their young and tender fronds shielded from the scorching influence of the atmosphere throughout the hot season, the slightest exposure to which causes all the softer and filmy textured species to droop and wither as if they had been seethed and dried. Thus, even in the grass Betle-houses are all those delicate species which inhabit the shady and perennially humid regions of the tropics eliminated, and cultivation restricted to a few semi-cosmopolitans and those of a hygrometric and deciduous character naturally adapted to a hot tropical season. Again, with respect to climatic influence, we find that the latter species have much greater powers of accommodation than the former and thus find in the conservatory a mutually luxuriating home, where hygrometricity and deciduousness give in general place to a perennial verdance.

The experimental glass fernery in the Botanical Gardens is a span-roofed house about 40 ft, long by 20 ft. wide, having a centre teak table with a path round it and side tables of the same material; under the latter there is an encircling trough for containing water during the hot season, and nearly on a level with this are several small trap-doors to which ventilation is chiefly confined during the hot months. The admission of air being thus below the tables an increased evaporation and a consequent reduction of temperature is secured without the plants being injured in the least: the dry and hot external air being sufficiently cooled and humidified ere it comes in contact with them. The temperature of the house is thus and by the aid of white painted glass kept considerably below that of the external air. Throughout the cold season when there is a freedom of hot winds the house is freely ventilated by the opening of alternate sashes along the sides and ridge. Over the roof and at a height of eighteen inches an iron rod framework is fixed for a light bamboo chick. This was originally intended for shading purposes in the hot season, but as a sufficiently diffuse light has been produced by the painting of the glass, and the temperature otherwise perfectly controlled, it is now used chiefly with a view to protection from the violent hailstorms which occasionally occur about the commencement of the hot season.

The conditions of moisture and temperature necessary for fern growth being very fairly attained in the above structure, it now only remains for me to remark briefly on their cultivation and propagation as adopted in the Botanical Garden here.*

With reference to cultivation, ferns are divided into two groups, characterised by very distinct modes of growth *viz.*

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* For all the details of fern culture, as also a most useful auxiliary to the study of these plants, I cannot too strongly recommend Mr Smith's book of "Ferns, British and Foreign," which may be had either direct from the publisher.—R. Hardwicke, 192, Piccadilly London, or ordered though one of the Calcutta book-sellers.

terrestrial and *epiphytal*. The first which is much the more extensive, (comprising all those species which, while presenting considerable variety in their mode of growth, root in the soil,) may be cultivated in the following manner. 'Pots with entire convex bottoms and holes round the sides at bottom varying from 2-6 according to the size of the pot are by far the best for securing a proper drainage. For the larger sized plants an inverted pot is first placed in the bottom of the pot to be used and the surrounding cavity filled with potsherds, and all carefully covered with cocoanut fibre, so as to prevent the soil being carried down into the drainage. The compost used consists of about one-half charcoal in pieces varying in size from a bean to an almond, or larger, equal parts of pure vegetable mould, sand and broken pieces of pot.

The best time for a general repotting of Ferns is I believe about the middle of the cold season when the majority of them are at rest, though it will often be found necessary to give changes to individual plants at other periods which may be safely done; special care being necessary in the hot months that the roots be not disturbed or the plant exposed to the sun or external air in the process. This cursorily is the method of cultivating the terrestrial group of ferns as practised in the Botanic Gardens, and very different from that adopted in gardens about Calcutta, in which—with a few exceptions—they may be seen barely existing in some more or less tenacious clay carefully preserved as that *in which* the *plant grew* in its *native habitats; ergo* it is practically maintained to be the best suited to the requirements of the plant? Not necessarily so: it must be remembered as years ago insisted on by the Hon. and Rev. W. Herbert, and more forcibly illustrated lately by Mr. Darwin, "that plants exist but in a nicely balanced struggle, in which they do not always find the conditions most favorable to their developement, but simply those which they can hold or are allotted in the unceasing organic warfare. In thus reflecting however, on the physical condition of plants in their native habitats, and their relations *inter se,* I would by no means have it believed that I thereby disparage the study of plants in their native localities as an auxiliary to their artificial management in our Gardens. Plants even though in nature living rather where they can, than where they would, do nevertheless afford most valuable cultural lessons, and I but deprecate that so called natural treatment which finds in a single relation—*e g.* the soil in which a plant grew in its habitat—the complement of the many diverse factors under which the plant lived and grew in its native habitat. Viewing it otherwise then, and taking fully into consideration the physical and organic relations of plants in their own habitats, and "the continuous adjustment of internal relations to external relations" *(H. Spencer,)* I repeat, that even with the struggle to which I have referred one may in general be largely guided in our practice by nature, assured that when we find plants more or less luxuriant under hard competition with their congeners they will be none the less so when freed from that, and cultivated so far as practicable under similar physical conditions.

Epiphytal ferns: this group (comprising those species which attach themselves to the bark of plants, but unlike true parasites derive no nourishment from it) is naturally, as I have previously stated, much less extensive than the former, or terrestrial group, and one which was yet poorly represented in the Botanic Garden collection. The stem of epiphytal ferns is very generally fleshy and prostrate, progressively producing fronds on its upper and roots on its lower side; and then technically called a *rhizome,* when slender and running, a *sarmentum,* and when erect or ascending, a *caudex.* Those with the latter form of stem and the smaller kinds of the others grow well when tied on charred blocks of Teak or Sissoo, and thinly covered with some of the finer tropical mosses.

The blocks may then be placed in shallow pots and the vacancy around them filled to within an inch of the surface with potsherds and then a layer of charcoal sufficient to present a surface convex to the rim of the pot; covering all over, less or more thickly according to the habit of plant, with moss. Those species with larger and more extensively ramifying stems may be grown in shallow pans or cylinders of galvanised wire-netting, the interior filled with pieces of Cocoanut husks and charcoal, all being kept in a sufficiently moist state, the roots will soon penetrate and induce a vigorous vegetation. Various other methods are recommended by Mr. Smith in the work above referred to and many more will naturally suggest themselves to the cultivator, according to his taste, and the space he may be disposed to give to a particular species.

The Hymenophyllums or Filmy-ferns are (as might be expected) by far the most difficult to manage in a climate like this. In introducing them therefore it is most essential to their success here, that they be attached to the object on which they naturally grew: better far that small portions be sent thus undisturbed, than as is too often the case basketsfuls of them, carelessly torn from the rocks or trees on which they flourished. Even with the greatest care, scarcely will one thus sent survive, so difficult are they to re-establish; but on the other hand, those—and especially the more tropical species—received with their natural affixments may be kept in a healthy and growing state, if care is taken to keep them under a deep shade and in a close and moist atmosphere. Such conditions may be readily attained by placing ordinary Wardian cases in the thatched orchid, or Betle-house. The glass of the cases must also be coated with white paint, as well for the diffusion of light as the rendering it less transparent to heat; and in the hot months it will be further necessary to over-shadow them with thin bamboo mats. They are now ready for the receipt of the plants, each of which must be again covered with a bell-glass during the dry season, so that they may be surrounded with a close and humid atmosphere: throughout the rainy and cold seasons the bell-glasses may safely be dispensed with. They are best grown in shallow pans filled to within an inch of the surface with broken potsherds, adding pieces of charcoal, sand-stone and partially decayed leaves so as to form a surface convex to the rim of the pot for receipt of plant.

With respect to the propagation of Ferns, many of the species present great facilities, while others can only be propagated with difficulty. First for propagation by spores, which may be done by the following and other modes: take a small sized pot—say 5 inch in diameter—and half fill with broken potsherds, cover thinly with cocoa-nut fibre to secure a free drainage, add an inch or so of about equal parts of leaf mould and soft kunkar, or the latter with an equal part of cocoa-nut refuse, leaving a vacancy of an inch between the surface compost and the rim of the pot. Having properly watered the compost the spores may then be sprinkled over the surface and covered with a circular piece of glass of the same diameter as the rim of pot Place now in a well-shaded Wardian case and cover the pot with a bell-glass the better to secure a close and humid atmosphere, so essential to the developement of the embryo fern: vegetation will in general be observable in a fortnight or three weeks after sowing. For raising the thoroughly tropical species the rainy season will I believe prove the most suitable, though these may also be raised in the other seasons by placing the spore-pots in saucers containing about half an inch of water. The extra-tropical species like many of the temperate annuals can only be raised in the cold season. Split cocoanut husks of themselves also form an excellent *nidus* for the germinations of ferns, requiring only to be well moistened previous to the sowing of the spores, a few small holes bored in the bottom to facilitate the percolation of water, and placed in a

Wardian case under bell-glasses as above recommended. Another, and I believe very successful, mode of raising ferns from spores—as also seeds of Orchids and other epiphytals of a delicate constitution—is to invert an ordinary bell-glass, which fill to a third of the top with sand, and saturate with water. Over the surface of the sand and to within an inch of the margin a layer of rough grained pieces of charcoal may next be added and on these distribute the spores, covering with another bell-glass slightly less—say half an inch—than that inverted, and place in a well shaded part of the house moistening, as may appear necessary, the exposed circle of sand. Again; in the glass fernery of the Botanic gardens here, as in European ferneries, the spores of many kinds find a natural *nidus* on the moist surfaces of the pots, shaded parts of the brick masonry &c., and there yield an abundant progeny. With a view to encourage this a layer of small pieces of charcoal (on the rough porous surfaces of which spores vegetate freely) has been placed on the floor below the centre table of the fernery.

The other modes of propagation afforded by Ferns, are by offsets as in the common *Nephrolepis*, by viviparous buds, either at the extremity of the frond, as in *Adiantum caudatum*, or in the axils of the segments, as in *Polypodium proliferum*, or by little bulbils on the upper surface of the segments; for an example of which, I must needs refer you to the *Sikkim*, *Asplenium furcatum*, now in the Botanic garden collection, as I know of no common fern in Lower Bengal which produces them. The species with creeping rhizomes as the common *Polypodium quercifolium*, P. *nigrescens*, P. *Irioides*, and the *Lomaria scandens*, are readily increased by cutting the stems, care only being necessary that each piece has a growing point.

In the cultivation of Ferns here, as in European gardens, there are unfortunately many insect pests to contend with, and these generally species which infest hothouse ferns in

Europe; where indeed, they have in many cases been imported along with tropical plants. Thus the mealy-bug—*Coccus*,—some three or four species of scale insects—*Aspidiotus*—the plant-lice or aphides—*Aphis*—and certain *Thysopoda* of which a species of *Thrip* is most frequent: all inhabit the fern fronds either feeding on their cuticle or sucking their juices, and from their extreme prolificity soon effecting considerable damage if not carefully watched and kept in check. This may be readily effected with the mealy-bug, aphides, and Thrips, by sponging the infected parts and then syringing the whole plant In the case of the scale-insects which adhere so closely to the cuticle, a soft brush is required to loose them previously to the syringing.

The cockroach—*Blatta orientalis*—is naturally much less troublesome in plant-houses in this country, than in those of European gardens, where a rigorous climate confines their plant depredations more especially to such structures: finding most genial habitats in the high and humid temperature of the tropical Orchid and Fern houses, and where from its rapidity of increase, it soon becomes when introduced, one of the most destructive of insect pests. Various modes of destroying them have thus been suggested; but these I need not repeat, as they are fortunately rare intruders in our ferneries, and may be readily extirpated when observed, by placing a few pieces of poisoned pastry—which they much prefer to the fern fronds—on the tables and other parts of the house where they may have committed depredations. The mole-cricket—*Gryllotalpa vulgaris*—though not observed in the glass-fernery, is a most dangerous enemy to Orchid and Fern cultivation in the thatched-houses, where the floors are as yet covered only with loose materials—not tile-paved as in the fernery—and thus afford the fullest scope for its burrowing propensities. As it is a night feeder, it frequently effects much damage ere its haunt is discovered; though when observed it may readily be dislodged by filling the burrow with water. If suspected to be lodging in the loose material of the Orchid pot—a most likely abode when covered as they usually and necessarily are in this country with cocoanut fibre or moss, for they are much too wary to burrow in a pot of uncovered compost—they may be readily dislodged by immersing the pot for a couple of minutes or so in tepid water.

The larva of some two or three Lepidopterous insects have also proved troublesome in the glass-fernery: eating and gnawing the young and unfolding fronds Fortunately however they are all day-feeders with which we have been troubled, so that with ordinary diligence they may be easily stayed in their destructive work. For nearly all such enemies hand-picking is perhaps the best remedy, as it too often happens that the young fronds are equally if not more susceptible to the effects of the many advertised mixtures than the larvæ whose destruction is aimed at.

With these few cursory remarks on the general treatment of ferns in Lower Bengal, I will now subjoin as above noted a list of the Cryptogams cultivated in the Botanical Gardens here, with descriptions of such species as appear to be new.

Order, I.—FILICES.*

Subordo. 1.—GLEICHENIACEÆ, BR.

1. GLEICHENIA. BR.

a. Mertensia.

1. *G. (Mertensia)* gigantea. *Wall. cat. n.* 157. *Hook. Sp. Fil. v.* 1. *p.* 5. *Bedd. Ferns of British India t.* 30.

Hab. Sikkim at elevations of from 6—8000 ft. Nipal and Assam. Perhaps one of the largest of the genus, forming as Dr. Wallich notes "impenetrable and extensive jungles"; introduced from Sikkim and the Khasia Hills in 1868.

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* In the general arrangement of the Order, the limitation of genera and in most cases of species, I have adhered to the "Species Filicum," of *Sir W. J. Hooker;* and to which I am also chiefly indebted for the Geographical distribution.

2. *G. (Mertensia)* dichotoma, *Willd. Hook. l. c. p.* 12. *Bedd. Ferns of South India,* 25. *t.* 74.

Hab. Frequent in nearly all tropical countries; introduced from Chittagong in 1867, and also from Sikkim and the Khasia Hills in 1868.

Subordo. 2.—POLYPODIACEÆ, Br.

Tribe 1.—CYATHEÆ, GAUD.

1.—CYATHEA. Sw.

a. Notocarpia.

1. C. *(Notocarpia)* sinuata, *Hook. et. Grev. Ic Fil. t.* 106. *Hook. Sp. Fil.* 1. *p.* 15. *Bedd. Ferns of South India,* 86. *t.* 259.

Hab. In Ceylon, "Forests in the Kokoole and Hinidoon Corles, at no great elevation; most abundant in the Singhe-rajah Forest" (*Thwaites Enum. Plant. Zeyl. p.* 326.); received from the Botanic Gardens, Ceylon, in 1865.

2. C. *(Notocarpia)* Hookeri, *Thw. Enum. Plant. Zeyl. p.* 396. *Bedd. Ferns of South India,* 86. *t.* 260.

Hab. In Singhe-rajah Forest, Ceylon; received from the Botanic Gardens, Ceylon, in 1865.

c. Eucyathea.

3. C. *(Eucyathea)* spinulosa, *Wall. in Herb.* 1823. *and Cat. n.* 178. *Hook. Sp. Fil. v.* 1. *p.* 25. *Bedl. Ferns of South India p.* 19. *t.* 57.

Hab. In the moist temperate and subtropical forests of Nipal, Sikkim, and Khasia, also in the Shevagherry hills; introduced from Sikkim in 1868.

2.—ALSOPHILA, Br.

a. Eualsophila.

1. A. *(Eualsophila)* latebrosa, *Wall.* Polypodium latebrosum *Wall. Cat. n.* 318. *Hook. Sp. Fil. v.* 1. *p.* 37. *Bedd. Ferns of South India p.* 20. *t.* 58.

Hab. In the moist forests of Assam, in several of the Mountains of the Western Peninsula: also in Penang and Sumatra; introduced from the Khasia Hills in 1868.

2. A. *(Eualsophila)* tenuicaulis, *De Vr. et Tsm*

Hab. In the Island of Ceram; received from the Botanical Gardens, Buitenzorg, Java in 1867.

3. A. *(Eualsophila)* glauca, *J. Sm. Hook. Journ. Bot.* 111. 419. Polypodium contaminans, *Wall. Cat. n.* 320. A. contaminans. *Wall. Cat. p.* 64. *Moore. Ind. Fil. p.* 50. *Bedd. Ferns of British India,* 85.

Hab. In the moist forest regions of Sylhet, Burmah, Penang, Java, and the Molucca Islands; introduced from Moulmein in 1866.

4. A. *(Eualsophila)* Brunoniana, *Wall. Cat. n.* 7073. *Hook, l. c. p.* 52. *Bedd. Ferns of British India, t.* 86.

Hab. In the dense forests of the Khasia and Naga Hills; introduced from the Khasia Hills in 1868.

5. A. *(Eualsophila)* glabra, *Hook. l. c. p.* 51. Polypodium giganteum, *Wall. Cat. n.* 321. Polypodium altissimum, *Wall. in Herb.* 1820. Cyathea venulosa, *Wall. Cat. n.* 180. Alsophila venulosa, *Wall. Cat. in Index,* Polypodium ? umbrosum, *Wall. Cat. n.* 336. *Hook. Sp. Fil. l. c. p.* 53. *Moore Ind. Fil. p.* 50. *Bedd. Ferns of South India p.* 20. *t.* 60.

Hab. In Sylhet, Khasia Hills, Nipal, and a few of the mountains in the Western Peninsula, and Ceylon, on the mountains of Tenasserim, Penang and Java; introduced from the Khasia Hills in 1868.

6. A. *(Eualsophila)* comosa, *Wall. Cat. n.* 319. *Hook. Sp. Fil. l. c. p.* 53. *Bedd. Ferns of British India,* 84.

Hab. In the humid tropical forests of the Khasia Hills: also in Singapore and Java; introduced from the Khasia Hills in 1868.

7. A. *(Eualsophila)* sp. No. 1.

Hab. In the humid temperate forests of Sikkim; introduced in 1867.

8. A. *(Eualsophila)* sp. No. 2.

Hab. In Sikkim, in the tropical vallies of the Rungbee and the Rungjo; introduced in 1867.

9. A. *(Eualsophila)* sp. No. 3.

Hab. In the moist forests of the Khasia Hills; introduced in 1868.

3.—MATONIA, Br.

1 M. pectinata, *Br. in Wall. Pl. Asiat. Rar.* 1. *t.* 16. *Bedd. Ferns of British India, t.* 186.

Hab. Peculiar—so far as known—to Mount Ophir, near Malacca, where it is found at an elevation of 4,000 ft. This handsome and rare fern, was introduced to the Botanic Garden in 1867, and is one of the many rare Malayan plants for which the Gardens here, are indebted to Dr. A. C. Maingay, Civil Surgeon, Malacca.

Tribe 2.—DICKSONIEÆ, GAUD.

1.—SPHÆROPTERIS. WALL. (*not Bernh.*)

1. S. barbata, *Wall in Herb.* 1823; *Cat. n.* 183; *Pl. Asiat. Rar.* 1. *t.* 48. *Hook. Sp. Fil.* 1. *p.* 58.

Hab. The summit of the mountains, Chandaghiri, and Sheopore, (10,000 feet) in Nipal; and Sinchul (7,000 feet and upwards) in Sikkim; introduced from Sinchul in 1867.

2.—DICKSONIA, L'HERIT.

a. Patania.

1. D. *(Patania)* scabra, *Wall. Cat. n.* 2173, *Hook. Sp. Fil v.* 1. *p.* 80.

Hab. In the temperate forests of the Himalaya Mountains, and in Eastern Bengal. Introduced from the Sikkim Himalaya and Chittagong in 1866.

3.—CIBOTIUM, KAULF.

1. C glaucescens, *Kze.; in Schkh. Suppl. p.* 63. *t.* 31. (*cult*), *Hook. Sp. Fil.* 1. *p.* 82. C. glaucum, *H. et A.* (*Hook. l. c.*) *Bedd. Ferns of British India,* 83 (*in part.*)

Hab. In the Philippine Islands and Sumatra; received from the Botanic Gardens Buitenzorg, Java in 1867.

2. C. Assamicum, *Hook l. c. p.* 83.

Hab. In the forests of Assam, and the Khasia Hills; introduced from the Khasia Hills in 1868.

4.—HYMENOPHYLLUM, SM.

1. H. crispatum, *Wall. Cat. n.* 169. *Hook. Sp. Fil.* 1. *p.* 105. *Hook. et Grev. Ic. Fil. t.* 77.

Hab. On trees in the humid temperate forests of Nipal, Sikkim, Assam and Ceylon: also in Tasmania and New Zealand; introduced from Sikkim in 1868.

2. H. Javanicum. *Spr. Syst. Veget.* 4. *p.* 132. *Hook. l. c. p.* 106.

Hab. In deep ravines, on moist rocks, or trees, in the dense forests of Sikkim, Assam, Java, and the Moluccas; introduced from Sikkim in 1868.

3. H. polyanthos, *Sw. Syn. Fil. p.* 149. *Hook. l. c. p* 106. *Bedd. Ferns of South India,* 88, *t.* 267.

Hab. Epiphytal in the temperate forests of Nipal, Sikkim, Assam: also in New Zealand, Brazil, Mexico, and the West Indian Islands; introduced from Sikkim in 1868.

5.—TRICHOMANES, SM.

a. Eutrichomanes.

1. T. *(Eutrichomanes)* filicula, *Bory. in Duperrey's Voy. Bot.* 1. *p.* 283. *Hook. Sp. Fil.* 1. *p.* 124. *Bedd. Ferns of South India;* 2, *t.* 7.

Hab. Epiphytal in the temperate forests of Sikkim, the Khasia Hills, the Nilgiri and Anamallay mountains, and Ceylon: also in Mauritius, and Bourbon; introduced from the Khasia Hills in 1868.

2. T. *(Eutrichomanes)* radicans, *Sw. Fil. Ind. Occ. p.* 1736. *Hook. l. c. p.* 125. *Bedd. Ferns of South India, t.* 181.

Hab. Tropical and temperate regions of the Northern Hemisphere, frequent in the humid temperate forests of Sikkim and Khasia; introduced in 1868.

3. T. *(Eutrichomanes)* dissectum, *J. Sm. in En. Fil. Philipp. (name only), Hook. l. c. p.* 140.

Hab. Epiphytal in the temperate forests of Sikkim and the Khasia Hills: also in Luzon; introduced from the Khasia Hills in 1868.

4. T. *(Eutrichomanes)* auriculatum, *Bl. En. Fil. Jav. p.* 225. *Hook l. c. p.* 133.

Hab. Frequent clothing the trunks of trees in the temperate forests of Sikkim and Khasia: also in Java; introduced from Sikkim in 1867.

Subordo. 3.—DAVALLIÆ.

1.—DAVALLIA, SM.

a. Humata.

1 D. (*Humata*) angustata, *Wall, Cat. n.* 242. *Hook. Sp. Fil.* 1. *p.* 152. *Bedd. Ferns. of South Ind. t.* 237.

Hab. Frequent creeping on trunks and branches of trees in the forests of Singapore and Penang; introduced in May 1868, by C. Macleod Esq. Registrar, Foreign Department (to whom the Gardens are also indebted for a valuable collection of other Malayan plants.)

b Leucostegia.

2 D. (*Leucostegia*) chærophylla, *Wall. Cat. p.* 259. *Hook. Sp. Fil.* 1. 157. D. ligulata, *Wall. Herb. n.* 254, Acrophorus pulcher. *Moore Ind. Fil. p.* 3. *Bedd. Ferns of South India,* 4 *t.* 10.

Hab. On trunks of trees in the temperate forests of the Himalaya in several of the Mountains in the Western Peninsula, and in Penang and Java; introduced from Sikkim in 1868.

3. D. *(Leucostegia)* sp.

Hab. Khasia Hills; introduced in 1867.

4. D. *(Leucostegia)* sp.

Hab. Khasia Hills; introduced in 1867.

5. D. *(Leucostegia)* sp.

Hab. Khasia Hills; introduced in 1867.

c. Eudavallia.

6. D. *(Eudavallia)* solida, *Sw. Syn. Fil. p.* 132 *and* 345.

var. β. latifolia; D. ornata, *Wall. Cat. n.* 246. *Hook. l. c. p.* 163. *Bedd. Ferns of Brit. India, t.* 104.

Hab. In Penang, Singapore, Assam, frequenting alike shaded and exposed sites, and epigæous or epiphytal; introduced from Assam in 1866.

7. D. *(Eudavallia)* elegans, *Sw. Syn. Fil. p.* 132.

γ bidentata, *Schkh. Fil. t.* 867. *Hook. l. c. p.* 165.

Hab. In the forests of Assam, Tenasserim, and the Malayan Peninsula, and like the last epigæous or epiphytal; introduced from Assam in 1861.

8. D. *(Eudavallia)* sp.

Hab. Clothing the trunks of trees in the temperate and subtropical forests of Sikkim and the Khasia Hills; introduced in 1868.

9. D. *(Eudavallia)* sp.

Hab. Khasia Hills; introduced in 1868.

d. Saccoloma.

10. D. *(Saccoloma,)* lonchitidea, *Wall. Cat. n.* 240. *Hook. l. c. p.* 173.

Hab. In the humid forests of Nepal, Khasia Hills, the Western Peninsula and Ceylon; introduced from the Khasia Hills in 1868.

11. D. (*Saccoloma,*) pinnata, *Cav. Præl.* 1801, *n.* 689; D. flagellifera. *Wall. Cat. n.* 243. *Hook. Sp. Fil. l. c. p.* 173. *Bedd. Ferns of South India* 5. *t.* 14.

Hab. On stumps and roots of trees in Singapore, Penang and the Anamallay Hills: also in the Philippine Islands, and Java; introduced from Singapore in 1868.

e. Odontoloma.

12. D. *(Odontoloma)* adiantifolia, *Hook. l. c. p.* 176.

Hab. On trees in Java and Moluccas; received from the Botanic Gardens Buitenzorg, Java in 1867.

f. Microlepia.

13. D. (*Microlepia*) polypodioides, *Don. Prod. Fl. Nep. p.* 10. D. virens, *Wall. Cat. n.* 264. D. Roxburghii, *Wall. Cat.* 2218. D. puberula, *in part Wall. Cat. n.* 262-5. D. pyramidata, *Wall. Cat. n.* 261. D. pilosula, *Wall. Cat.* 263. D.

rhomboidea, *Wall. Cat. n.* 257. *Hook. l. c. p.* 181. *Bedd. Ferns of South India*, 5. *t.* 15.

Hab. On the stumps and roots of trees &c. in the tropical, and subextratropical regions of the Old and New World; introduced from the Khasia Hills, and Parasnath in 1868.

g. Cuneatæ.

14. D. (*Cuneatæ*) tenuifolia, *Sw. Syn. Fil. p.* 133 *and* 350. D. chinensis, *Smith; Icon. Roxb.* 15. *t.* 119—*an unfinished pencil sketch*—*Wall. Cat. n.* 245. *Hook. l. c. p.* 186. *Moore Ind. Fil. p* 301. *Bedd. Ferns. of South India* 6. *t.* 11.

Hab. Very widely dispersed over India and the Archipelago; also in China, Java, and Madagascar; introduced from Singapore in 1868.

2.—LINDSÆA. DRY

a. Eulindsæa.

1. L. (*Eulindsæa*) cultrata, *Sw. Syn. Fil. p.* 119, L. odorata, *Roxb. Icon* 15. *t.* 109 *Hook. Sp. Fil.* 1. *p.* 203. *Bedd. Ferns of South India* 7. *t.* 23.

Hab. In deep ravines, on overhanging rocks in Nipal, Sikkim, Sylhet, Assam, and in the Western Peninsula: also in the Philippine Islands, and Java; introduced from Sikkim in 1868.

Subordo. 4.—PTERIDEÆ.

1.—ADIANTUM, L.

1. A. macrophyllum, *Sw. Syn. Fil. p.* 122. *Hook. Sp. Fil. v.* 2. *p.* 3.

Hab. In tropical America and the West Indies; received from the Botanic Gardens, Buitenzorg, Java in 1867.

2. A Kaulfussii, *Kze. in Linnæa*, 1848. *p.* 221. *Hook. l. c. p.* 7.

Hab In tropical America, West Indies, and Mexico; received from the Royal Gardens Kew in 1868.

3. A. obliquum, *Willd. Sp. Pl.* 5. *p.* 429. *Hook. l. c. p.* 8.

Hab. In South America, Porto Rico, Caraccas, received from the Royal Gardens Kew in 1868.

4. A. lunulatum, *Burm. Fl. Ind.* 235. A. proliferum, *Roxb. Crypt. Plt. Cal. Jour. Nat. Hist.* 4. *p.* 512. *Hook. l. c. p.* 11. *Bedd. Ferns of South India. t.* 1.

Hab. A very common fern, widely spread over tropical Asia, and America. In Bengal; abundant on old brick buildings in the vicinity of Calcutta, and called by the natives "Kalee—jhamp"—from the resemblance the pinnæ bear to the form of the slab on which the black Goddess Kálí is fixed.

5. A. flagelliferum—? not A. flagelliferum, *Wall. Cat. n.* 76. which is a small, and rigid form of A. caudatum, *L.*

Hab. The plant was received under the above name from the Botanic Gardens, Buitenzorg, Java in 1867.

6. A caudatum, *L. Mant. p.* 308. *Icon. Rox.* 15. *t.* 110, *Hook. l. c. p.* 13. *Beddome's Ferns of South India* 1. *t.* 2

Hab. Widely spread over India from Ceylon to the Himalaya, also in the Archipelago, China and Japan

var. β; A. ciliatum, *Bl. in. En. Fil. Java, p* 215.

Hab. In the crevices of rocks on the Mountain Parasnath; also in Java, Madras and Arabia Felix.

var. β. is distinguished by the generally glabrous pinnæ, and ciliated margin, in Bengal *var. a.* is common in shady places, on the ruins of brick buildings, &c.

7. A. prionophyllum, *H. B. K. Nov. Gen. Am.* 1. *p.* 16. *Hook. l. c. p.* 21.

Hab. In tropical America and the West Indies; received from the Royal Gardens Kew in 1867.

8. A patens, *Willd. Sp. Pl.* 5. *p.* 439. *Hook. l. c. p.* 29.

Hab. In tropical America; received from the Botanic Gardens Buitenzorg, Java in 1867.

9. A. trapeziforme, *L. Sw. Syn. Fil. p.* 29. *Hook. l. c. p.* 33.

Hab. In tropical America, West India Islands; received from the Botanic Gardens Buitenzorg in 1867.

10. A. cultratum, *J. Sm. Hook. l. c. p.* 34. *Moore in Gard. Chron.* 1855. *p.* 660.

Hab. In St. Vincent; St. Catharines, Brazil; received from the Royal Gardens Kew in 1867.

11. A. Capillus-Veneris, *L. Sp. Pl. p.* 1558. *Hook. l. c.* p. 36. *Bedd. Ferns of South India* 2. *t.* 4.

Hab. In the tropical and temperate zones of both Hemispheres; very common in the temperate forests of the Western Himalaya; the plants in the Botanic Gardens were introduced in 1866, from a deep ravine near the so-called burning springs, on the Seetakoond range of hills, Chittagong.

12. A. Æthiopicum, *Linn. Sp. Pl. p.* 1560. *Hook. l. c. p.* 37. *Bedd. Ferns of South India* 2. *t.* 5.

Hab. In Chittagong, and the Nilgiris: also in South Africa, Madagascar, Abyssinia, and South America; introduced from the hills near Chittagong (were it occurs with A. *Capillus-Veneris* L.) in 1866.

13. A concinnum, *H. B. K. Nov. Gen et Sp. Am.* 1. *p.* 17. *and* 7. *t.* 668. *Hook. l. c. p.* 42.

Hab. In tropical America: received from Europe in 1864.

14. A. tenerum, *Sw. Fl. Ind. Occ.* 3. *p.* 1719 *Hook. l. c. p.* 45.

Hab. In Central America and the West Indian Islands; received from Europe in 1864.

15. A. formosum, *Br. Prodr. Fl. Nov. Holl. p.* 155. *Hook. l. c. p.* 31.

Hab. In tropical Australia, and New Zealand; received from Europe in 1864.

16. A. "St. Catharinæ, *Lndl." in Cat. Bot. Gard. Buit. Java p.* 4.

Hab St. Catharine's Brazil? received from the Botanic Gardens, Buitenzorg, Java in 1867.

2.—CHEILANTHES, Sw.

1. C. argentea, *Hook. Fil.* 2. 76. *Exot. Ferns t.* 95. *with vars. Bedd. Ferns of Brit. India, t.* 143.

var. α. argentea vera, *Hook. l. c. f.* 2. *and* 4.

var. β. sulphurea, *Hook. l. c. f.* 3.

var. γ. chrysophylla, *Hook. l. c. f.* 1. 6. 7. *and* 8.

Hab. **The *var.* α. is the most widely dispersed of the three, occurring in the crevices of rocks on the temperate mountains of**

the Western Himalaya, Khasia Hills and other localities in Eastern Bengal, and Burmah ; also in Kamtschatka, Siberia and N. W. America. *Var.* β. and γ. are most abundant in the Khasia Hills, whence with *var.* a. they were introduced to the Botanic Gardens, in 1868, though they have also been found on limestone rocks near Moulmein, and *var* γ. seems to be frequent about Simla.

2. C. farinosa, *Kaulf. En. Fil. p.* 212. *Wall. Cat.* 71. *Hook. l c. p.* 77. *Bedd. Ferns of South India* 65. *t.* 191.

Hab. In crevices of rocks &c., throughout the temperate regions of the Himalaya, in the Western Peninsula, Ceylon, Arabia, Abyssinia, and Mexico; introduced from Sikkim and the Khasia Hills in 1868.

3. C tenuifolia, *Sw. Syn. Fil. p.* 129 and 332. C. rupestris, *Wall. Cat.* 67. *and* C. micrantha, *Wall. Cat.* 68., *Hook. l. c p.* 82. *Bedd. Ferns of South India* 64. *t.* 188.

Hab. Very widely dispersed over India; in the E. Himalaya, Central India, the Western Peninsula, and Ceylon, the Malay Peninsula and Islands: also in China, Australia and New Zealand; introduced from Purneah in 1868.

3.—ONYCHIUM, KAULF.

1. O. auratum, *Kaulf. En. Fil. p.* 144 Lomaria aurea, *Wall Cat. n* 38. L. caruifolia, *Wall. Cat.* 39. *Hook. l. c. Sp.* 121. *Bedd. Ferns of South India,* 10. *t.* 30.

Hab. In Nipal, Sikkim and the Khasia Hills, on the Paulghaut Mountains: also in the Malay Islands and Java ; very common on the woodless flanks of mountains on Sikkim, with fronds thickly covered on the under side with a rich yellow powder, and much exceeding in beauty the ochry colored fronds on the plants from its Malayan habitats.

2 O. lucidum, *Spreng. syst. Veget.* 4.. *p.* 66. Cheilanthes lucida, *Wall. Cat.* 69. *and* C. contigua, *Wall. Cat.* 72. *Hook. l. c. p.* 121

Hab In the temperate forests of the Western Himalaya, Sikkim and the Khasia Hills; introduced from Sikkim in 1867.

4.--PTERIS. LINN.

α. Eupteris.

1. Pt. (*Eupteris*) longifolia, *L. sp. Pl. p.* 1531. *Hook. Sp. Fil.* 2. *p* 157. P. amplexicaulis, *Icon. Roxb. t.* 106. P. amplectens, *Wall. Bedd. Ferns of South India* 11. *t.* 33.

Hab. Tropics and North temperate zones; in shady places very frequent in Bengal, indigenous in the Botanic Gardens

2. Pt. (*Eupteris*) cretica, *L. Mant. p.* 130. P. læta, *Wall. Cat.* 95. and P. nervosa, *Wall. Cat. p* 96 *Hook. l. c. p.* 159.

Hab. Tropics and North temperate zone; introduced from Sikkim in 1867.

var. albo. lineata; *Hook, Bot. Mag. t.* 5194.

Hab. In Java; received form the Botanic Gardens Buitenzorg in 1865

3. Pt. (*Eupteris*) crenata, *Sw. Syn. Fil. p.* 96. *and* 290. P. ensiformis, *Wall. Cat.* 2481 *and* P. multidentata, 2681. *Hook, l. c. f.* 163.

Hab. In the Eastern Himalaya Mountains, Western Peninsula, Ceylon: also in China, South Pacific Islands, and Tropical New Holland; introduced from Sikkim in 1866

4. Pt. (*Eupteris*) serrulata, *L. fil. Suppl. p.* 425. (*excl. syn.*) *Hook. l. c. p.* 167.

Hab. In Japan and Hongkong, in very general cultivation in the Gardens about Calcutta.

5. *Pt.* (*Eupteris*) semipinnata, *L. Sp. Pl, p.* 1534. *Hook. l. c. p.* 169. *Bedd. Ferns of South India* 11. *t.* 34.

Hab. In the mountainous regions of Eastern Bengal, the Western Peninsula, Pegu, and Tenasserim: also in China, Japan, Hongkong and Borneo; introduced from Moulmein in 1866.

6. Pt. (*Eupteris*) tremula Br. *Prod. Nov. Holl. p.* 154. *Hook. l. c. p.* 174.

Hab. In Australia and New Zealand; has been long cultivated in Calcutta Gardens, though yet far from common.

7. Pt. (*Eupteris*) quadriaurita, *Retz. Obs.* 6. *p.* 38. *Hook. l. c. p.* 179. *Bedd. Ferns of South India* 11. (*in part*) *t.* 31.

Hab. Very widely dispersed over the tropical and subtropical regions of both hemispheres: throughout the Himalayan Mountains, in the Western and Eastern Peninsula, and Hongkong: also in Senegambia, Fernando Po, and tropical America; introduced from Sikkim in 1867.

8. Pt. (*Eupteris*) aspericaulis, *Wall Cat. No.* 107. P. pectinata, *Don.* Pteris quadriaurita, *var.* rubro-nerva, *Bedd. Ferns of South India p.* 11.

var. rubro—nervia; *P.* rubro—nervia. *Linden.*

Hab. Frequent in the temperate and subtropical forests of Nipal, and Sikkim, sparingly on the Anaumallys and Nilgiris; introduced from Sikkim in 1867.

b. Ornithopteris.

9. Pt. (*Ornithopteris*) aquilina, *L. Sp. Pl. p.* 1533.

var β. lanuginosa, *Hook. l. c. p.* 196. *Bedd. Ferns of South India* 14. *t.* 42.

Hab. In the woodless, mountainous regions of India: also in South Africa, Madeira and Teneriffe; introduced from Sikkim in 1867.

c. Campteria.

10. Pt. (*Campteria*) nemoralis, *Willd. Sp. Pl. p.* 386. *in part. Hook. l. c. p* 202.

Hab. Very frequent in the tropical forests of India, and Ceylon: also in China, Bourbon, and Sierra Leone; introduced from Chittagong in 1866.

11. Pt. (*Campteria*) biaurita *L. Sp. Pl. p.* 1534. *Wall. Cat. n.* 100, *in part. Hook. l. c. p.* 203.

Hab. In the temperate forest-clad mountain regions, and tropical valleys of India, and Ceylon; also in tropical Western Africa, and Brazil; introduced from Sikkim in 1867.

d. Litobrochia.

12. Pt. (*Litobrochia*) incisa, *Thunb. Fl. Cap. p.* 733. P. sinuata, *Wall. Hook. l. c. p.* 230.

Hab. The Indian distribution of this plant is, I believe, limited to the temperate mountain regions of Sikkim and the Khasia Hills, though widely dispersed in the extra Indian regions of the North and South tropical zones; introduced from Sikkim in 1868.

5.—CERATOPTERIS, BRONGN.

1. C. thalictroides, *Brongn. Bullet. Soc. Philom. p.* 184. Pteris succulenta, *Icon. Roxb. t.* 108. *and in Cal. Jour. Nat. Hist.* 4. p. 508. *Wall Cat.* 83. *Hook. Sp. Fil.* 2. *p.* 235. *Bedd. Ferns of South India,* 25. *t.* 57.

Hab. In the tropical and subtropical zones of both Hemispheres —very common in rice fields, margins of tanks &c, in Bengal, interesting alike for its anomalous structure and peculiar habit, as also being one of the few known annual ferns; indigenous in marshy places in the Botanic Gardens.

Subordo 5.—LOMARIEÆ.

1—LOMARIA. WILLD.

a. Plagiogyria.

1. *L.* (*Plagiogyria*) euphlebia, *Kz. in Bot. Zeit.* 6. 521. *Hook. Sp. Fil.* 3. 20 *Bedd. Ferns of British India, t.* 165.

Hab. Very abundant in the temperate Himalayan forests, in Eastern Bengal and the Malayan Peninsula; introduced from Chittagong in 1867.

2—BLECHNUM, L.

1. B. Brasiliense, *Desv. in Berl. Mag.* 5. *p.* 330 *Hook. Sp. Fil.* 3. 42.

Hab. In Brazil; received from the Royal Gardens Kew in 1867

2. B. orientale, *L. Sp. Pl. p.* 1535. *Hook. l. c. p.* 52. *Bedd. Ferns of South India,* 10. *t.* 29.

Hab. In the humid, forest-clad flanks of the Himalayan mountains, the Western Peninsula, in Eastern Bengal, Burmah and the Malayan Peninsula: also in Java, and China, introduced from Chittagong in 1866, and from the Khasia Hills in 1868.

3. B. occidentale, *L. Sp. Pl. p.* 1534.

var. minor. *Hook. l. c. p.* 50, *Wall. Cat. n.* 56.

Hab. In Mexico, Panama, Guatemala, Jamaica, South Brazil; received from the Royal Gardens Kew in 1867.

Subordo 6.—ASPLENIEÆ.

1.—ASPLENIUM, L.

a. Thamnopteris.

1. A. (*Thamnopteris*) Nidus, *L. sp Pl. p.* 1537 *Hook. Sp. Fil.* 3. 77. *Bedd. Ferns of British India, t.* 197.

Hab. Epiphytal, or terrestrial in the temperate and humid tropical forests of India; also in China and Hongkong, and other tropical and subtropical regions of the old world; introduced from Sikkim in 1867.

2. A. (*Thamnopteris*) musæfolium, *Metten Asplen. p.* 85. *Hook. l. c. p.* 78

Hab. On trees in the humid forests of Singapore, Malacca, and Luzon; introduced from Singapore in 1868.

3. A. (*Thamnopteris*) Phyllitidis, *Don. Prod. Nep. p.* 7. *Hook. Sp. Fil.* 3. 80. *Bedd. Ferns of South. Ind. p.* 42. *t.* 123.

Hab. In the moist forests of the Eastern Himalaya, Eastern Bengal, the Anamallyas, Penang and Java; introduced from Sikkim in 1867.

4. A. (*Thamnopteris*) Grevellii, *Wall. Cat.* 1036, *Hook. Sp. Fil.* 3. *p.* 80. *Bedd. Ferns of British India, t.* 66.

Hab. Epiphytal in the forests of Eastern Bengal, Burmah, Tenasserim and Singapore; introduced from Singapore in 1868.

b. Eusasplenium.

5. A. (*Eusasplenium*) Griffithianum, *Hook. Sp. Fil.* 3. *p.* 87. *Bedd. Ferns of British India, t.* 58.

Hab. Epiphytal in the temperate forests of Sikkim, Assam, and the Khasia Hills; introduced from Sikkim in 1867.

6. A. (*Eusasplenium*) ensiforme *Wall. Cat.* 200. *Hook. Sp. Fil.* 3. *p.* 89. *Beddome's Ferns of South India* 43. *t.* 125.

Hab. Epiphytal in forests throughout the Himalayan range, the Western Peninsula and Ceylon; introduced from Sikkim and the Khasia Hills in 1868.

7. A. (*Eusasplenium*) alternans, *Wall. Cat. n.* 221. *Hook. Sp. Fil.* 3. *p.* 92. *Beddome's Ferns of British India, t.* 59.

Hab. In the temperate forests of Kumaon and Simla; Sikkim, below Darjeeling on moist, moss—covered rocks; introduced from Sikkim in 1867.

8. A. (*Eusasplenium*) lineatum, *Sw. Syn. Fil. p.* 77. *Hook. Sp. Fil.* 3. *p.* 104.

Hab In Mauritius and Bourbon; received from the Botanic Gardens Mauritius in 1867.

9. A (*Eusasplenium*) erectum, *Bory. in Willd. Sp. Pl. p.* 510. *Hook. l. c. p.* 126.

var. α. normale; A. pulchrum, *Wall. Cat.* 2211.

Hab. A very widely dispersed and variable species, in the tropical and subtropical regions of the New and the Old World; introduced from Sikkim in 1868.

10. A (*Eusasplenium*) compressum, *Sw. Syn. Fil. p* 79. *Hook. Sp. Fil.* 3. *p.* 121

Hab. In St. Helena, and not as yet known from elsewhere; received from the Royal Gardens Kew in 1867.

11. (*Eusasplenium*) dentatum, *Linn. Sp. Pl. p.* 1540. *Hook. Sp. Fil.* 3. *p.* 130

Hab In tropical America; received from the Royal Gardens Kew in 1867.

12. A. (*Eusasplenium*) resectum, *Sm. Ic. Ined. t.* 72. A. latum, *Wall. Cat.* 209, A. decurrens, *Wall. Cat.* 190. A. trapeziforme, *Roxb. Crypt Plts. Cal. Jour. Nat. Hist* 4, 497 *and Wall. Cat. n* 66. *Hook. Sp. Fil,* 3. *p.* 130. *Bedd. Ferns of South India,* 45. *t.* 132.

Hab. In moist forests, on trees, or on moist overhanging rocks in the Himalaya Mountains and Eastern Bengal; introduced from Sikkim and Khasia Hills in 1867.

13. A. (*Eusasplenium*) heterocarpum, *Wall. Cat.* 218. *Hook. Sp. Fil.* 3. *p.* 132. *Bedd. l. c. p.* 44. *t.* 131.

Hab. In the temperate forests of Nipal and Khasia, in the Nilgiris, Moulmein and Ceylon; introduced from the Khasia Hills in 1868.

14. A. (*Eusasplenium*) Trichomanes, *L. Sp. Pl. p.* 1540. *Hook. Sp. Fil.* 3. *p.* 136. *Bedd. l. c.* 49. *t.* 146.

Hab. In the mountain regions of Northern India, the Nilgiris: also in Australia, South Africa, Madeira, Europe, and North America, introduced from Sikkim in 1867.

15. A (*Eusasplenium*) multijugum, *Wall. Cat. n.* 207. *Hook, Sp. Fil.* 3. *p.* 139. *Bedd. Ferns of South India* 45. *t.* 33.

Hab On trees in the temperate forests of Nipal, Sikkim, Assam, the Nilgiris and Ceylon; introduded from Sikkim in 1867.

16. A. (*Eusasplenium*) macrophyllum, *Sw. in Schrad. Jour* 1800. 2 *p.* 52 A. coriaceum, *Roxb. Crypt Plts. Cal. Jour. Nat. Hist. p.* 497. A. Finlaysonianum, *Wall. Cat n.* 191. *Hook. l. c. p.* 158 *Bedd. Ferns of South India p.* 48.

var. urophyllum, *Hook. l. c.* A. urophyllum, *Wall Cat. n.* 192, and A. Tavoyanum, *n.* 1035, *Bedd. l. c.* 48. *t.* 142.

Hab On roots and stumps of trees in the dense forests of Sikkim and Assam, the Nilgiris, Ceylon, Chittagong, Tenasserim, Malayan Peninsula and Islands; also in China and Mauritius: the normal form was introduced from Assam and Chittagong in 1866, and the *var.* urophyllum, from Sikkim in 1867.

17. (*Eusasplenium*) platicaule, *Wall. Cat. n.* 189. *Hook. Sp. Fil.* 3. *p.* 163 *Bedd. Ferns of South India* 47. *t.* 139.

Hab. On trees in the mountain forests of the Himalayan Mountains, Parasnath, and in the Western Peninsula and Ceylon; introduced from Parasnath and the Khasia Hills in 1868.

18. A. (*Eusasplenium*) laciniatum, *Don. Prod. Fl. Nep. p.* 8. *Hook. l. c. p.* 164. *Bedd. Ferns of South India,* 49. *t.* 145.

var. bipinnatum, *Hook. l. c.* A. cæspitosum *Wall. Cat. n.* 217. *Bedd. l. c.*

var. subintegrifolium, *Hook. l. c.* A. depauperatum, *Wall. Cat.* 234. *Bedd. l. c.*

Hab. In forests on trees in the Central and Eastern Himalaya, and the Nilgiris; the two forms were introduced to the Botanic Gardens, from Sikkim and the Khasia Hills in 1867.

19. A. (*Eusasplenium*) laserpitiifolium, *Lam. Encycl. p.* 310, A. tripinnatum, *Roxb. Crypt. Plts. Cal. Jour. Nat. Hist. p.* 500. *Hook Sp. Fil.* 3. *p.* 171. *Bedd. Ferns of South India,* 75. *t.* 225.

Hab. In the Andaman Islands, Malay Archipelago and Ceylon; also in Java, China, Fejee Islands, N. E. Australia, and Mexico; introduced from the Andamans in 1867.

20. A. (*Eusasplenium*) nitidum, *Sw. Syn. Fil. p.* 84. *Hook. Sp. Fil.* 3 *p.* 172

var. β. obtusatum, *Bedd. Ferns of South India,* 50. *t.* 148.

Hab. On trees in the moist tropical forests of Sikkim, and Assam in the Nilgiris; introduced from Sikkim, in 1867.

21 A. (*Eusasplenium*) bulbiferum, *Forst. Prod. p.* 80. A. bullatum, *Wall. Cat.* 215. *Hook l. c. p.* 196.

Hab. On trees in the humid forest region of the Himalaya Mountains, and in Penang :-also in Australia, New Zealand, and Tropical America; introduced from Sikkim in 1868.

22. A (*Eusasplenium*) tenuifolium, *Don. Prod. Fl. Nep. p.* 8. *Hook. Sp. Fil.* 3. *p.* 193. *Bedd. Ferns of South India, p.* 44. *t.* 130.

Hab. Generally on moss—covered trees in the temperate forests of Nipal and Sikkim, in the Nilgiris and Ceylon; introduced from Sikkim in 1867.

23. A. (*Eusasplenium*) cicutarium, *Sw. Prod. p.* 130. *Hook. Sp. Fil.* 3. *p.* 188.

Hab. In tropical America; received from the Royal Gardens Kew in 1867.

24. A. (*Eusasplenium*) rutæfolium, *Kze. in Linnæa,* 10. *p.* 521. *Hook Sp. Fil.* 3. *p.* 206.

Hab A native of South Africa; received from the Botanic Gardens Mauritius in 1868.

25. (*Eusasplenium*) prolongatum, *Hook. Sp. Fil.* 3. *p.* 209. *Bedd. Ferns of South India p.* 47. 138.

Hab. On trees in the humid forests of the Eastern Himalaya and Ceylon; introduced from the Khasia Hills in 1868.

26. A. (*Eusasplenium*) Belangeri, *Kze. Bot. Zeit.* 6. *p.* 176. *Hook. Sp. Fil.* 3. *p.* 209.

Hab. In Java, on stems and roots of trees in the mountainous regions; received from the Royal Gardens Kew in 1867.

27. A. (*Eusasplenium*) viviparum, *Pr. Tent. Pterid. p.* 109 *Wall. Cat.* 239. *Hook. Sp. Fil.* 3. 215.

Hab. In Bourbon and Mauritius; received from the Botanic Gardens Mauritius in 1864.

c. *Athyrium.*

28. A. (*Athyrium*) Filix,—fœmina, *Bernh. Schrad. N. Jour. Bot.* 1806. 1. *pt.* 2. *p.* 26. Polypodium dentigerum, *Wall. Cat.* 334. *Hook. l. c. p.* 217 *Bedd. Ferns of South India,* 51. *t.* 154. *var.* tenuifrons; Allantodia tenuifrons *Wall. Cat. n.* 206.

var. tenella; Allantodia tenella, *Wall.*

Hab Very widely distributed in the temperate regions of the Old and New World; in India throughout the temperate Himalayan range, and in the Western Peninsula; the normal form and varieties were introduced from Sikkim and the Khasia Hills in 1868.

29. A. (*Athyrium*) Hohenackerianum, *Kze. in Schk. Fil. Suppl.* 2. *p.* 63. *Hook. Sp. Fil.* 3. *p.* 220. *Bedd. Ferns of South India,* 50 *t.* 150.

Hab. In the temperate forest of Sikkim, in the Western Peninsula and Sindh; introduced from Sikkim in 1867.

30. A. (*Athyrium*) macrocarpum, *Blume, in Herb. Hook. Hook. l. c. f.* 222. *Bedd. Ferns of South India,* 51. *t.* 152.

Hab. In the Eastern Himalaya Mountains, Western Peninsula, Ceylon and Java; introduced from Sikkim in 1868.

31. A. (*Athyrium*) grammitoides, *Hook. Ic. Pl. t.* 913. *and Sp. Fil l. c. p.* 228. Diplazium grammitoides, *Presl. Epim. Bot. p.* 84. *Moore. Ind. Fil. p.* 329.

Hab. In shady ravines, in the crevices of moist rocks on the mountain Parasnath (2-3000 feet elevation), and in Singapore: also in Java, and the Philippine and Society Isles; introduced from Parasnath in 1868.

32. A. (*Athyrium*) australe, *Brack. Fil. U. St. Expl. Exp. p.* 173. A. spectabile, *Wall. Cat. n.* 237. *and* A. multicaudatum, *Wall. Cat. n.* 229. *Hook. Sp. Fil.* 3. *p.* 232. *Bedd. Ferns. of South India,* 52 *t.* 158.

Hab. In Nepal, Sikkim, and the Nilgiris; also in Java and Australia; introduced from Sikkim in 1867.

d. Eudiplazium.

33. A. (*Eudiplazium*) Janceum *Th. Fl. Jap. p.* 333. *Hook. Sp. Fil.* 3 *p.* 235. *Bedd. Ferns of South India,* 75. *t.* 227.

Hab. In Nipal, Sikkim, Khasia Hills, Ceylon; also in Hong-Kong, Japan; introduced from Sikkim in 1867.

34. A. (*Eudiplazium*) fraxinifolium, *Wall. Cat. n.* 194. *Hook. Sp. Fil.* 3. *p.* 240. *Bedd. Ferns of Brit. India, t.* 69.

Hab. In the humid forest regions of the Khasia Hills, Assam, Sikkim, Singapore and Penang; introduced from Assam in 1867.

35. A. (*Eudiplazium*) dilatatum, *Hook. l. c. p.* 258. A. diversifolium *Wall. Cat. n.* 203. (*not Bl.*) *Bedd. Ferns of South India,* 53, *t.* 162.

Hab. In the forests of the Eastern Himalaya, Eastern Bengal, both Peninsulas and Ceylon; also in China, Hong-Kong and Java; introduced from Sikkim and the Khasia Hills in 1868.

36. A. (*Eudiplazium*) *sylvaticum, Pr. Rel. Hænk.* 1. *p.* 42. *Hook. sp. Fil.* 3. *p.* 248. Diplazium sylvaticum, *Thunb. Bedd. Ferns of South India,* 53 *t.* 161.

Hab. In Sikkim, Chittagong, Nilgiris, Malacca, Java, Mauritius; introduced from Sikkim in 1868.

e. Anisogonium.

37. A. (*Anisogonium*) esculentum, *Pr. Rel. Hænk.* 1. *p.* 45. *Hook. l. c. p.* 268. Callipteris malabarica, *J. Sm. Cat. cult. Ferns* (1857) (Asplenium bipinnatum, *Roxb. Cal. Jour. Nat. Hist.* 4. 499. A. esculentum, and A. proliferum, *Wall. Cat.* 202. A. puberulum *Wall. Cat.* 2212. Callipteris ambigua, *Moore's Ind. Fil. p.* 216.) *Bedd. Ferns of South India,* 54. *t.* 144

Hab. Throughout the Indian Continent, and Ceylon; in moist shady places by the margins of tanks, in the vicinity of the Botanic Gardens it is not unfrequent; also in South China, Hong-Kong, the Fejee Islands and Java.

38. A. (*Anisogonium*) decussatum, *Sw. Syn. Fil. p.* 76 *and* 260. Asplenium proliferum, *Wall. Cat.* 236. *Hook. l. c. p.* 270.

Hab. In the humid forests of the Eastern Himalaya, the Malayan Archipelago also in Tropical W. Africa; introduced from the Khasia Hills in 1868.

f. Hemedictyum.

39. *A.* (*Hemedictyum*) Finlaysonianum, *Wall. Cat. n.* 191. *Hook. Sp. Fil.* 3. *p.* 271. *Bedd. Ferns of British India, t.* 72.

Hab. In forest ravines in the Eastern Himalaya, and the Malayan Peninsula; introduced from Sikkim in 1867.

2.—ALLANTODIA, WALL.

1. A. Brunoniana, *Wall. Pl. Asiat. Rar. p.* 44. *t.* 52. and Asplenium reticulatum. *Cat. n.* 188. *Hook. Sp. Fil.* 3. *p.* 275. *Bedd. Ferns of South India,* 52. *t.* 159.

Hab. In the forests of the Eastern Himalaya, the Western Peninsula and Ceylon: also in Java, and Tahiti; introduced from the Khasia Hills in 1867.

3.—ACTINIOPTERIS.

1. A. radiata, *Link, Fil. Sp. Hort. Berol. p.* 80. Acrostichum radiatum *Kœnig. Mss.*; *Icon. Roxb.* 15. *t.* 90. Asplenium radiatum, *Sw.*; *Wall. Cat. n.* 197. *Hook. Sp. Fil,* 3. 276. *Bedd. Ferns of South India,* 43. *t.* 124.

Hab. In the crevices of rocks, and in stony places in North West India, the Western Peninsula, and Burmah: also in Bourbon, Madagascar, South Africa, Arabia and Egypt; introduced from Mirzapore in 1868.

Subordo 7.—ASPIDIACEÆ, PR.

1.—ASPIDIUM, SW.; HOOK. SP. FIL. V. 4. P. 6.

a. Polystichum.

1. A. (*Polystichum*) *Thomsonii, Hook. l. c. p.* 7. *Bedd. Ferns of British India, t.* 126.

Hab. In the temperate forests of Kumaon and Sikkim; introduced from Sikkim in 1867.

2. A. (*Polystichum*) auriculatum, *Sw. Syn. Fil. p.* 44. *Hook. l. c. p.* 11.

var. α. normale, *Hook. l. c. Bedd. Ferns of South India,* 41. *t.* 120.

var. β. coriaceum, *Hook. l. c.* A. marginatum *Wall. Cat. n.* 366.

var. γ. sub-bipinnatum, *Hook. l. c.* A. ocellatum, *Wall. Cat. n.* 98. *Bedd. Ferns of Brit. India, t.* 136.

Hab. In the mountainous districts of the Western Peninsula and Ceylon the normal form is common, though occurring with the others also throughout the Himalayan Mountains; the three forms were introduced from Sikkim and the Khasia Hills in 1868.

3. A. (*Polystichum*) cæspitosum, *Wall. Cat. n.* 367. *Hook. l. c. p.* 13.

Hab. In the temperate forest of the Himalaya; and introduced from Sikkim in 1868.

4. A. (*Polystichum*) aristatum, *Sw. Syn Fil. p* 53. *Hook. l. c p.* 27. *Bedd. Ferns of Southern India,* 36. *t.* 101.

Hab. Throughout the temperate mountain regions of the Himalaya very common, Eastern Bengal, Western Peninsula and Ceylon; also in China, Japan, in the Philippine Islands, Java and Borneo; introduced from the Khasia Hills in 1868.

5. A. (*Polystichum*) coriaceum, *Sw. Syn. Fil. p.* 57. *Hook. l. c. p.* 32.

Hab. In South America, S Africa, Tasmania, New Zealand; received from the Royal Gardens Kew in 1867.

6. A. (*Polystichum*) aculeatum, *Sw. in Schrad. Jour.* 1800. 2. *p.* 37. A. setosum, *Wall. Cat. n.* 371. *Hook. l. c. p.* 18. *Bedd. Ferns of South India,* 41. *t.* 121, *and* 122.

Hab. Very abundant in the mountain regions of the North of India, and the Western Peninsula; in Ceylon, the Malay Peninsula and Islands; and indeed very generally dispersed over the temperate regions of both hemispheres; introduced from Parasnath in 1868.

b. *Cyrtomium.*

7. A. (*Cyrtomium*) falcatum, *Sw. Syn. Fil. p.* 43. *Hook. Sp. Fil.* 4. *p.* 40.

Hab. In China and Japan; introduced from China in 1859.

8. A. (*Cyrtomium*) Fortunei, *J. Sm. Ferns British and Foreign, p.* 286.

Hab. In Japan; received from the Royal Gardens Kew in 1867.

9. A. (*Cyrtomium*) caryotideum *Wall. Cat. n.* 376. *Hook. Sp. Fil.* 4. *p.* 40. *Bedd. Ferns of South India,* 41. *t.* 119.

Hab. In the mountainous regions of India, the Western and Eastern Himalaya, and Madras Peninsula; also in S. Africa; introduced from the Sikkim Himalaya in 1864.

c. *Euaspidium.*

10. A. (*Euaspidium*) trifoliatum, *Sw. Syn. Fil. p.* 43. *Hook. Sp. Fil.* 4. *p.* 45.

Hab. In Tropical America; received from the Royal Gardens Kew in 1867.

11. A. (*Euaspidium*) alatum, *Wall. Cat. n.* 378. *Hook. Sp. Fil.* 4. *p.* 47.

Hab. On trees in the moist forest regions of Eastern Bengal, Malayan Peninsula, Java and Borneo; introduced from the Khasia Hills in 1868.

12. A. (*Euaspidium*) cicutarium, *Sw. in Schrad. Jour.* 1803. 2. *f.* 279. *Hook. l. c. p.* 48. (*in part.*)

Hab. In the forests of Eastern Bengal, and Ceylon; also in Java, Tropical Africa and America; introduced from Chittagong in 1866.

13. A. (*Euaspidium*) apiifolium, *Schk. Fil. p.* 128. A. cicutarium. *var.* apiifolium, *Hook. l. c. p.* 49.

Hab. In ravines on the Mountain Parasnath. In Sumatra, the Sandwich Islands and New Caledonia; introduced from Parasnath in 1868.

14. A. (*Euaspidium*) coadunatum, *Wall. Cat. n.* 337. *Hook. and Grev. Ic. Fil. t.* 202; Sagenia coadunata, *J. Syst. Gen. Fil.; Bedd. Ferns of South India*, 28. *t.* 81.

Hab. On the Eastern face of the Mountain Seetakoond, Chittagong, and the hilly districts of the Western Peninsula; introduced from Seetakoond in 1866.

15. A. (*Euaspidium*) giganteum, *Bl. En. Fil. Jav. p.* 159. *Hook. l. c. p.* 50. *Bedd. Ferns of South India*, 27. *t.* 80.

Hab. In the forests of Eastern Bengal, the Western Peninsula, Ceylon, and Java; introduced from Chittagong in 1866.

16. A. (*Euaspidium*) variolosum, *Wall. Cat. n.* 379. *Hook. l. c. p.* 51.

Hab. In the forests of Eastern Bengal, Parasnath, Tenasserim and the Malayan Peninsula; introduced from Chittagong in 1866, and Parasnath in 1868.

17. A. (*Euaspidium*) polymorphum, *Wall. Cat. n.* 382. A. rostratum. *Wall. Cat. n.* 383. *Hook. l. c. p.* 54. *Bedd. Ferns of South India*, 40. *t.* 116.

Hab. In the forest regions of the Himalaya the Western and Eastern Peninsula, and Ceylon; also in Borneo and Tropical Africa; introduced from Sikkim in 1867.

18. A. (*Euaspidium*) macrophyllum, *Sw. Syn. Fil. p.* 43, *Hook. l. c. p.* 55.

Hab. Throughout Tropical America; received from the Royal Gardens Kew in 1868.

2.—NEPHRODIUM.

a. Eunephrodium.

1. N. (*Eunephrodium*) molle, *Desv. Mem. Soc, Linn.* 6. *p.* 258. Polypodium parasiticum, *Roxb, Crypt. Plts. l. c. p.*

492. Aspidium appendiculatum, *Wall. Cat.* (*in part*) A. canescens, *Wall. Cat. n.* 354. (*in part*) Polypodium molusculum, *Wall. Cat. n.* 332. P. appendiculatum, *Wall. Cat. n.* 349. P. nemorale, *Wall. Cat. n.* 1317. Aspidium parasiticum, *Wall. Cat. n.* 2239. A. solutum, *Wall. Cat. n.* 350. A. tectum, *Wall. Cat. n.* 394, *Hook. l. c.* p. 67. *Bedd. Ferns of Southern India*, 29. *t.* 84.

Hab. In the tropical and sub-tropical Zones of both Hemispheres. In moist shady places in the vicinity of Calcutta very common.

2. N. (*Eunephrodium*) extensum, *Bl. En. Fil. Jav. p.* 156. Aspidium multijugum, *Wall. Cat. n.* 348 *Bedd. Ferns of Southern India*, 31. *t.* 85.

Hab. In the Eastern Himalaya, Western and Eastern Peninsula, Ceylon, Java, and Tropical West Africa; introduced from Chittagong in 1866.

3. N. (*Eunephrodium*) pteroides, *J. Sm. Ferns British and Foreign*. N. terminans, *J. Sm. Hook l. c. p.* 73. Aspidium terminans *Wall. Cat. n.* 386. *Bedd. Ferns of Southern India*, 32. *t.* 90.

Hab. In the Western Himalaya, Eastern Bengal, both Peninsulas, and Ceylon: also in Java and China; introduced from Chittagong in 1866.

4. N. (*Eunephrodium*) propinquum, *Br. Prodr. Fl. Nov. Holl. p.* 148. Polypodium secundum, *Wall. Cat. n.* 301. *Hook. l. c. p.* 79. *Bedd. Ferns of Southern India*, 32. *t.* 89.

Hab. Very widely dispersed over the Indian Continent, Ceylon, Malay Peninsula and Islands; also in China, Java, New Holland, Africa, and Tropical America; introduced from Chittagong in 1866.

5. N. (*Eunephrodium*) unitum, *Sieb. Syn. Fil. N.* 43. Aspidium venulosum, *Wall. Cat. n.* 352. Polypodium scabridum, *Wall. Cat. n.* 302. *Hook. l. c. p.* 81. *Bedd. Ferns of Southern India*, 31. *t.* 88.

Hab. In the Himalaya Mountains, the mountainous tracts of the

Western Peninsula, Ceylon, and Malay Peninsula; also in Java, China and the Feejee Islands; introduced from Sikkim in 1867.

b. Lastrea.

6. N. (*Lastrea*) erythrorachis, *nov. sp.*

Rhizome thick, shortly creeping, copiously covered with brown subulate scales. *Fronds* tufted, pinnate 2—2½ ft. high, including stipes of from 11—14 in.,—scaly below, above nearly glabrous and throughout a pinky red colour. *Pinnæ* 18—30, lanceolate acuminate 4—5 in. long, serrate, glabrous, somewhat obliquely cordate at the base, shortly petiolate with a larger lanceolate, crenately serrate, terminal lobe. *Veins* conspicuous, sub—pinnately forked. *Venules* excurrent,

Sori. copious sub-triserial between margin and costa. *Indusium* cordato-reniform.

A very pretty species, introduced from the Khasia Hills in 1867.

7. N. (*Lastrea*) gracilescens, *Hook. l. c. p.* 93. *(in part) Bedd. Ferns of British India, t.* 253.

Hab. In the temperate and subtropical forests of the Himalaya: also in Java; introduced from Sikkim in 1868.

8. N. (*Lastrea*) falciculatum, *Desv Mem Soc. Linn.* 6. *p.* 241. *Hook. l. c. p.* 102. Lastrea chrysoloba, *Presl.*

Hab, In Brazil, and Mexico; received from the Royal Gardens Kew in 1868.

9. N. (*Lastrea*) apiciflorum, *Hook, l. c. p.* 112. Aspidium *Wall. Cat. n.* 345. *Bedd. Ferns of British India, t.* 40.

Hab. In the temperate forests of Nipal and Sikkim; introduced from Sikkim in 1867.

10. N. (*Lastrea*) barbigerum, *Hook. l. c. p.* 115. *Bedd. Ferns of British India,* 227.

Hab. In the temperate forests of the Western Himalaya, Nipal and Sikkim; introduced from Sikkim in 1868.

11. N. (*Lastrea*) Filix-mas, *Rich. in Desv. Mem. Soc. Linn.* 6. *p.* 260. *Hook l. c. p.* 116.

Var. γ. elongatum, *Hook. l. c.* Aspidium marginatum, *Wall. Cat. n.* 391.

Var. δ. cochleatum, *Hook. l. c.* Arthrobotrys avara, *Wall. Cat. n.* 1034. *and* A. macrocarpa *Wall. Cat. n.* 395, Lastrea cochleata *Moore. Bedd. Ferns of Southern India,* 39. *t.* 115.

Hab. A very polymorphous and widely distributed species, abundant in nearly all temperate regions. In the mountainous districts of India frequent in a variety of forms. *Var. γ.* was introduced to the Botanic gardens from Sikkim and the Khasia Hills in 1867, and *var. δ.* from Parasnath—on the slopes of which it is abundant—in 1868.

12. N. (*Lastrea*) splendens, *Hook. l. c. p.* 126. Lastrea splendens, *Wall. in Hook. fil. Ms. Cat. of Ind. Ferns, n.* 267. *Bedd. Ferns of British India, t.* 42.

Hab. In the moist temperate forests of Nipal and Sikkim; also in the Malay Peninsula; introduced from Sikkim in 1868.

13. N. (*Lastrea*) membranifolium, *Pr. Reliq. Hœnk. p.* 36. Aspidium fuscipes, *Wall. Cat. n.* 361. *Bedd. Ferns of Southern India,* 36. *t.* 102.

Hab. In the humid forests of Eastern Bengal, Western Peninsula, Burmah, Tenasserim, Malay Peninsula and Archipelago, and Ceylon; introduced from Chittagong in 1866.

14. N. (*Lastrea*) purpurascens, *Hook. l. c. p.* 132. Aspidium densum, *Wall. Cat. n.* 390. and A. nitidulum, *Wall. Cat. n.* 392. Lastrea sparsa, *Moore, Bedd. Ferns of Southern India,* 36. *t.* 103.

Hab. Abundant in the mountainous districts of India and Ceylon; also in Java and the Mauritius; introduced from Sikkim in 1868.

15. N. (*Lastrea*) divisum, *Hook. l. c. p.* 133, Aspidium divisum *Wall. Cat. n.* 393. L. divisa, *Wall. Bedd. Ferns of Southern India,* 35. *t.* 97.

Hab. Throughout the temperate regions of the Himalaya and in the mountainous tracts of the Western Peninsula, introduced from Sikkim in 1867.

16. N. (*Lastrea*) eriocarpum, *Decaisne Archiv. Mus.* 2. *p.* 185. Aspidium, *Wall Cat. n.* 324. A. pilosulum *n.* 837, *and,* A. subdiaphanum, *n.* 343. *Hook. Sp. Fil. l. c. p.* 141. *Bedd. Ferns of Southern India,* 33. *t.* 95.

Hab. In the subtropical and temperate forests of the Himalaya; on the Western slopes of the Mountain Parasnath in crevices of overhanging rocks, alt. 2000-3000 feet, rare; the Anamallays, on the Peringoonda Hill alt. 5000 feet (*Beddome*), Moulmein, and the banks of the Irawaddy: also in Abyssinia, and the Cape de Verdes; introduced from Parasnath in 1868.

17. N. (*Lastrea*) tenericaule, *Hook. l. c. p.* 142. Polypodium tenericaule. *Wall. Cat. n.* 335. P. ornatum, *Wall. Cat. p.* 327. *Bedd. Ferns of Southern India,* 35 *t.* 99.

Hab. Throughout the humid forest tracts of the Indian Continent, and Ceylon; also in China, Java and Borneo; introduced from Assam in 1868.

18. N. (*Lastrea*) villosum, *Pr.;* Aspidium, *Sw. Syn. Fil. p.* 56. *Hook. l. c. p.* 134.

Hab. In the West Indian Islands; received from the Royal Gardens Kew in 1868.

19. N. (*Lastrea*) Raddianum, *Hook. l. c. p.* 98. Lastrea vestita, *J. Sm. Ferns British and Foreign p.* 155.

Hab. In Brazil; received from the Royal Gardens Kew in 1867.

20. N. (*Lastrea*) effusum.

Hab.?; received from the Royal Gardens Kew in 1867.

21. N. (*Lastrea*) divergens.

Hab.? received from the Royal Gardens Kew in 1867.

22. N. (*Lastrea*) sericeum, *nov. sp.*

Rhizome erect, tufted, paleaceous, furnished with numerous wiry roots. *Fronds* 9—13 in. high, oblong-lanceolate bipinnatifid, membranaceous ; *rachis* plano—convex, sericeo,—pubescent. *Pinnæ* 1—2 in. (lowest pair incurved, deflexed, shorter than the 2 or 3 next pairs) sessile, oblong-acute, pinnatifid, segments oblong—obtuse, slightly falcate, crenato—ciliate. *Veins* conspicuous, pinnate. *Sori*, biserial on each segment, and near the base of the venules. *Indusuim* reniform, entire.

Hab. In Chittagong ; introduced from Seetakoond in 1866.

23. N. (*Lastrea*) asperulum, *nov. sp.*

Rhizome stout ascending, copiously covered with silky-brown, subulate, flexuose scales, ¾ of an inch long. *Fronds* 1½—2 ft. high, ovate-acuminate, to broadly lanceolate, pinnate, with an elongated, deeply pinnatifid, coriaceo,—membranaceous, terminal pinnæ ; *stipes* slender, with a few scattered subulate scales below. *Pinnæ*, 14—24, lanceolate—acuminate, 3—7 inch long, pinnatifid ; *segments*, oblong acute, serrulate. *Veins*, evident, uniformly dichotomous ; the lower anterior venules terminating within the areoles in a short erect rigid process, forming characteristic medial lines on either side of the midrib. *Sori*, small on the anterior venules, antimarginal, in 2 rows in each segment. *Indusuim* small, reniform.

Hab. In crevices of rocks on the mountain Seetakoond ; introduced in 1866.

3—NEPHROLEPIS, SCHOTT.

1. N. tuberosa, *Pr.* Aspidium tuberosum, *Bory, in Willd. Sp. Pl.* 5. *p.* 234. Aspid. sublanosum, *Wall. Cat. n.* 365. (*in part) Hook. Sp. Fil. v.* 5. *p.* 151. *Bedd. Ferns of Southern India*, 33. *t.* 92.

Hab. A very abundant fern in the tropics of both hemispheres ; its fleshy tubers are eaten by the poorer natives in times of scarcity and the young fronds are much used by the Dhangers of Nagpore in their curries &c.,

2. N. hirsutula, Pr. Aspid. hirsutulum, *Schk. Fil. t* 33. Polypodium davallioides, *Icon. Roxb.* 15. *t.* 99. Davallia multiflora, *Roxb. H. B. p.* 75. *Roxb. Crypt. Plts. Cal. Jour. Nat. Hist* 4. 515. *(in part)*

Hab. Throughout the Indian Continent, Ceylon, Malayan Archipelago, and Java. In thickets, mango groves &c., in the vicinity of the Botanic Gardens, Calcutta.

3. N. exaltata, *Schott.* Aspidium exaltatum, *Sw Syn Fil. p* 45. Polypodium flagelliferum, *Roxb. Icon.* 15. *t.* 99. Aspidium flagelliferum, *Wall. Cat. n.* 2234. *Hook. l c p.* 152. *(in part); Bedd. Ferns of Southern India,* 33. *t.* 93 *(in part.)*

Hab In the tropics of both Hemispheres very frequent; growing with the last named species in the vicinity of the Botanic Gardens.

4. N. ensifolia, *Presl., J. Sm. Ferns, British and Foreign (in part) p.* 164

Hab. Tropical America, received from the Royal Gardens Kew in 1867.

4. OLEANDRA, Cav

1. O. neriiformis, *Cav. Prael* 1801. *n.* 623. *Hook. Sp. Fil.* 4 *p.* 156. *Bedd. Ferns of South India, p.* 32 *t.* 91.

Hab. In Tropical and subtropical Asia, West Africa, and tropical South America; very common in the humid, subtropical forests of Sikkim, festooning with a profusion of graceful fronds the trunks of the highest trees; introduced from Sikkim in 1867.

5. ONOCLEA, Metten.

a. Struthiopteris.

1. O. *(Struthiopteris)* orientalis, *Hook.* 2nd. *Cent. of Ferns t.* 4. *and Sp. Fil.* 5. *p.* 161

Hab. In the temperate regions of the Sikkim Himalaya, Assam, Khasia Hills: also in Japan: introduced from the Khasia Hills in 1868.

Subordo, 8.—POLYPODIEÆ, PR.

1. POLYPODIUM, LINN. HOOK. SP. FIL. 4. P. 163.

a. Eupolypodium.

1. P. *(Eupolypodium)* trichomanoides, *Sw. Syn. Fil. p.* 184. *Hook. l. c. p.* 178. *Bedd. Ferns of British India, t.* 2.

Hab. On moist rocks in the temperate Zones of the Sikkim Himalaya, in Malacca: also very frequent in Tropical America; introduced from Malacca in 1867.

2. P. *(Eupolypodium)* subfalcatum, *Bl. Fil. Jav. p.* 186. *t.* 87. A. B. *Hook. l. c. p.* 193. *Bedd. Ferns of British India, t.* 189.

Hab. In Kumaon, Nipal, and the Sikkim Himalaya; also in Java; introduced from the vicinity of Darjeeling—where it is not at all uncommon on moist shady rocks—in 1867.

3. P. *(Eupolypodium)* Plumula, *H. B. K. in Willd. Sp. Pl.* 5. *p.* 178. *Hook l. c. p.* 200.

Hab. Frequent in Tropical America; received from the Royal Gardens Kew in 1867.

4. P. *(Eupolypodium)* pectinatum, *L. Sp. Pl. p.* 1545 *Hook. l. c. p.* 203.

Hab. Throughout Tropical America; received from the Royal Gardens Kew in 1867.

5. P. *(Eupolypodium)* *Schkuhrii, Rad. Fil. Bras. p.* 19 *t.* 27. *f.* 2. *Hook. l. c. p.* 204.

Hab. In Brazil and Jamaica; received from the Royal Gardens Kew in 1867.

b. Phegopteris.

6. P. *(Phegopteris)* davallioides, *Mett. Polypod. p.* 32. Polyp. coniifolium, *Wall. Cat. n.* 326. *Hook. Sp. Fil. l. c. p* 256.

Hab. In Nipal, Sikkim, Himalaya, the mountains of the Malay Islands and Java; introduced from Sikkim in 1867.

7. P. (*Phegopteris*) rugulosum, *Labill. Fil. Nov. Holl.* 2. *p.* 92. *t.* 241. Polyp. viscosum, *Roxb.* P. marginale, *Wall. Cat. n.* 322, Aspidium marginatum, *n.* 391. *and* A. divisum *n.* 393. *Hook. l. c. p.* 272. *Bedd. Ferns of South India*, 56. *t.* 170.

Hab. Throughout the temperate Himalaya Mountains, the Nilgiris and Ceylon: also in China, Java, New Holland and South America; introduced from Sikkim in 1867.

c. Goniopteris.

8. P. (*Goniopteris*) scolopendroides, *Sw Syn. Fil. p.* 33. *Hook. Fil. Exot. t.* 18.

Hab. In damp forests, on rocks, in the West Indian Islands; received from the Royal Gardens Kew in 1867.

9. P. (*Goniopteris*) tetragonum, *Sw. Syn. Fil. p.* 77. *Hook. Sp Fil.* 5 *p.* 3.

α angustifolia; *Hook. l. c.* P. tetragonum, *Schk. Fil. p.* 22

β. latifolium; Polyp. megalodes, *Schk Fil. p.* 24.

Hab. In tropical America; received both varieties, from the Royal Gardens Kew in 1867.

10. P. (*Goniopteris*) urophyllum, *Wall. Cat. n.* 299. (*excl. n.* 3.) *Hook. l. c. p.* 9. *Bedd. Ferns of South India*, 79 *t.* 239.

Hab. In the temperate and subtropical forests of the Eastern Himalaya; in Burmah, Tenasserim and Ceylon: also in Java, China and the Feejee Islands; introduced from Sikkim in 1867.

11. P. (*Goniopteris*) multilineatum, *Wall. in. Hook. Herb*, *Hook. l. c p.* 11. *Bedd. Ferns. of British India*, *t.* 231.

Hab. In the forests of the Eastern Himalaya, and the Mountain Parasnath; whence it was introduced in 1868.

12. P. (*Goniopteris*) proliferum, *Roxb. Icon.* 15. *t.* 101. *and in Wall. Cat. n.* 312. *Hook. l. c. p.* 13. *Bedd. Ferns of South India*, 57. *t.* 172,

Hab. Very frequent in many parts of India; also in China, Java and South Africa; indigenous in the Botanic Gardens, and common in moist shady places about Calcutta,

d. Phlebodium.

13. P. *(Phlebodium)* aureum, *Linn. Sp. Pl p.* 1546. *Hook l. c. p.* 16.

var. α. sporadocarpum; Polyp. sporadocarpum, *Willd. Sp. Pl.* 5. *p.* 171.

Hab. In the West Indian Islands; received from the Royal Gardens Kew in 1867.

e Goniophlebium

14 P. *(Goniophlebium.)* appendiculatum, *Linden; Hook. Fil. Exot. t.* 89. Goniophlebium appendiculatum, *Moore in Gard. Chron.* 1856.

Hab. In Venezuela and Mexico; received from the Royal Gardens Kew in 1867.

15 P. *(Goniophlebium)* Catharineæ, *Fisch. and Langsd. Fil. p* 9. *Hook. l. c. p.* 20.

Hab. In Brazil; received from the Royal Gardens Kew in 1867.

16. P. *(Goniophlebium)* amœnum, *Wall. Cat. n.* 290. *Hook. l. c. p.* 24. *Bedd. Ferns of British India, t.* 5.

Hab. Very frequent in the temperate forests of the Himalaya, climbing high trees, and clothing their trunks with its handsome fronds; introduced from Sikkim in 1867.

17. P. *(Goniophlebium)* lachnopus, *Wall. Cat. n.* 310 *Hook. l. c. p.* 25. *Bedd. Ferns of British India, t.* 163.

Hab. In the moist forests of the Himalaya, climbing or creeping on trees and rocks; introduced from Sikkim in 1867.

18. P. *(Goniophlebium)* fraxinifolium, *Jacq. Ic. Rar. t.* 639. *Hook. l. c. p.* 26.

Hab. Frequent in Tropical America; received from the Royal Gardens Kew in 1867.

19. P. *(Goniophlebium)* menisciifolium, *Langsd. and Fisch. Fil. p.* 11. *Hook. l c. p.* 27.

Hab. In Brazil; received from the Royal Gardens Kew in 1868.

20. P. (*Goniophlebium*) neriifolium, *Sw. Syn. Fil. p.* 37. *Hook. l. c. p.* 28.

Hab. In Tropical America; received from the Royal Gardens Kew in 1867.

21. P. (*Goniophlebium*) verrucosum, *Wall. Cat. n.* 296. *Hook. l. c. p.* 31.

Hab. In the Malayan Peninsula, Amboyna, Ceram and Java; introduced accidentally with Orchids from the Botanic Gardens, Buitenzorg, Java in 1867.

f. Craspedaria.

22. P. (*Craspedaria*) serpens, *Sw. Syn. Fil. p* 26. *Hook. l. c. p.* 35.

Hab. In West Indies; received from the Royal Gardens Kew in 1867.

23. P. (*Craspedaria*) stigmaticum, *Pr. Reliq Hænk. p.* 20 *Hook. l. c p* 36.

Hab. In Central America, received from the Royal Gardens Kew in 1867.

g. Campyloneuron.

24. P. (*Campyloneuron*) Phyllitidis, *Linn. Sp. Pl. p.* 1543 *Hook. l c p.* 38.

Hab. In Tropical America; received from the Royal Gardens Kew in 1867.

25. P. (*Campyloneuron*) repens, *Linn. Plum. Fil. t* 134 *Hook. l. c. p* 39

Hab. In Tropical South America; received from the Royal Gardens Kew in 1867.

26. P. (*Campyloneuron*) lucidum, *Beyr. Hb.; Hook. l. c. p.* 41.

Hab. In Brazil; received from the Royal Gardens Kew in 1868.

27. P. (*Campyloneuron*) decurrens, *Raddi, Fil. Bras p.* 23. *Hook. l. c. p.* 42.

Hab. In Brazil; received from the Royal Gardens Kew in 1868.

h. Niphobolus.

28. P. (*Niphobolus*) angustatum, *Sw. Syn. Fil. p.* 27. *and* 224. Polypod. sphœrocephalum, *Wall Cat. n.* 272. *Hook. l. c p.* 43. *Bedd. Ferns of South India, p.* 62. t. 186.

Hab. On trees in the forests of Assam, and the Malayan Peninsula; also in Borneo, the Coral Islands, Tahiti and North East Australia; received from the Royal Gardens Kew in 1867.

29. P. (*Niphobolus*) acrostichoides, *Sw. Syn. Fil. p.* 29. *and* 225. Polyp. furfuraceum *Wall. Cat. n.* 278. *Hook. l. c. p.* 44.

Hab. In the Malayan Peninsula, and Ceylon; also in Java and the North-east Coast of Australia; introduced from Singapore in 1867.

30. P. (*Niphobolus*) adnascens, *Sw. Syn. Sil. p.* 25. *and* 228 Polyp. pertusum, *Roxb. Icones.* 15. *t.* 94. *Wall. Cat. n.* 267. *and* 268. Polyp. vittarioides, *Wall. Cat p.* 270. *Hook. l. c. p.* 47. *Bedd. Ferns of South India,* 62. *t.* 184.

Hab, Widely dispersed in the tropics of the Old World; in Lower Bengal, it is very common on trees of Mango, Sapota &c., and indigenous in the Botanical Gardens.

31. P. (*Niphobolus*) caudatus, *Kaulf. En. Fil. p.* 127. *Bl. Fil. Jav. p.* 56. *t.* 22.

Hab. In Singapore and the Molucca Islands; introduced from Singapore in 1867.

32. P. (*Niphobolus*) porosum, *Wall. Cat. n.* 266. Polyp. tomentosum *Roxb. Icones* 15. *t.* 95. P. Mysurense *Heyne, Wall. Cat. n.* 269. *Hook. l. c. p.* 48. *Bedd. Ferns of South India,* 62. *t.* 183.

Hab. In the temperate and subtropical forests of the Himalaya, the Western Peninsula and Ceylon; introduced from Sikkim in 1868.

33. P. (*Niphobolus*) Lingua, *Sw. Syn. Fil. p.* 29. *Hook. l. c. p.* 49. *Bedd. Ferns of South India*, 81. *t.* 240.

Hab. In the subtropical forests of the Eastern Himalaya, and Ceylon; also common in China and Japan; introduced from Assam in 1867.

34. P. (*Niphobolus*) costatum, *Wall. Cat. p.* 265. *Hook. l. c. p.* 50. *Bedd. Ferns of British India, t.* 120.

Hab. Throughout the subtropical regions of the Himalaya, on rocks on the Mountain Parasnath, and in the Malayan Peninsula: also in New Guinea and Java; introduced from Sikkim and Parasnath in 1868.

35. P. (*Niphobolus*) Gardneri, Metten, Polyp. *p.* 129.

var. α. subferruginea, *Hook. l. c. p.* 51. *Bedd. Ferns of South India*, 81. *t.* 241.

Hab. On roots and stumps of trees in the Khasia Hills, and in Ceylon; introduced from the Khasia Hills in 1868.

i. Phymatodes.

36 P. (*Phymatodes*) Wightiana, *Wall. n.* 2,222. P. loriforme, *Wall. Cat. n.* 271. P. sesquipedale, *Wall. Cat. p.* 275. *Hook. l. c. p.* 57. *in part. Bedd. Ferns of South India*, 60. *t.* 180.

Hab. A frequent epiphyte in nearly all the temperate and subtropical forest regions of India; also in China, Japan, Abyssinia, South Africa; introduced from Sikkim, and Parasnath in 1868.

37. P. (*Phymatodes*) excavatum, *Willd. Sp. Pl.* 5. *p.* 158. P. gladiatum, *Wall. Cat. n.* 279. Pleopeltis excavata *J. Sm Ferns British and Foreign p.* 87.

Hab. In the Mountain regions of India; also in China, and the Mauritius; introduced from Sikkim in 1867.

38. P. (*Phymatodes*) Griffithianum, *Hook. Ic. Pl. t.* 951. *and Sp. Fil.* 5. *p.* 62. *Bedd. Ferns of British India, t.* 158.

Hab. Frequent on trees and rocks, in the humid forest regions of Bhotan, Sikkim and the Khasia Hills; introduced from Sikkim in 1867.

39. P. (*Phymatodes*) rhyncophyllum, *Hook. Ic. Pl.* 955. *and Sp. Fil.* 5. *p.* 65 *Bedd. Ferns of British India, t.* 9

Hab. Climbing on trees, or creeping on moss covered rocks, in the subtropical forest regions of the Eastern Himalaya; introduced from the Khasia Hills in 1868.

40. P. (*Phymatodes*) irioides, *Lam.* Polyp. glabrum, *Roxb. Icones* 15. *t.* 93. *and in Wall. Cat n* 281. P polycephalum *Wall. Cat. n* 273. *Hook. l. c p.* 67. *Bedd. Ferns of South India,* 59. *t.* 178.

Hab. In India, very widely dispersed: also in China, Australia, New Caledonia, and South Africa; indigenous in the Botanic Gardens, and frequent on old Mango trees in the vicinity of Calcutta.

41. P. (*Phymatodes*) musæfolium, *Bl. Fil. Java. p.* 141. *Hook. l. c p.* 67.

Hab. In the moist forests of Singapore: also in Java; introduced from Singapore in 1867.

42. P. (*Phymatodes*) normale, Don. Prodr. Fl Nep. 1.

var. α normalis, *Hook. l c. p.* 70.

var β. latifrons, *Hook. l. c. Bedd Ferns of South India, t.* 10.

var. γ. sparsisora, *Hook. l. c.* Polyp longifrons *Wall. Cat. n.* 274.

Hab. On trees in the subtropical forests of the Eastern Himalaya, Eastern Bengal, and Tenasserim: also in China and Formosa; *var α.* and *γ* were introduced from Sikkim and the Khasia Hills in 1867; *var. β.* from Chittagong in 1866.

43. P. (*Phymatodes*) membranaceum, *Don. Prodr. Fl. Nep. p.* 2. P. grandifolium *Wall. Cat. n.* 282. (*a very large fern*) *Hook. l. c. p.* 70. *Bedd. Ferns of South India, p.* 59. *t.* 177.

Hab. In India, frequent in the temperate and subtropical forests, climbing on trees, or creeping over the mossy rocks; introduced from Parasnath in 1868.

44. P. (*Phymatodes*) hemionitideum, *Wall. Cat. p.* 214. *Hook. l. c. p.* 73. *Bedd. Ferns of South India,* 61. *t.* 182.

Hab. In the forest regions of the Eastern Himalaya, and in the Western Peninsula; epigæous or epiphytal; introduced from Sikkim in 1867.

45. P. (*Phymatodes*) tridactylon, *Wall. Cat. n* 315. *Hook. Sp Fil. l. c. p.* 75. *Bedd. Ferns of South India,* 60. *t* 179.

Hab. In streams, and their banks, on rocks and roots of trees, in the tropical and subtropical forests of Nipal, the Eastern Himalaya, Chittagong, Moulmein, and the Madras Peninsula,—"the Anamallays very abundant in rivers : 3000 to 4000 feet elevation, growing on rocks under water" *Beddome.* Also in the Malay Islands: Isle of Samar, and Java; received from the Gardens, Belvidere in 1868,

46. P (*Phymatodes*) nigrescens, *Bl. Fil Jav. p.* 101. *t.* 70. P. excavatum, *Roxb. Icones* 15. *t* 97. P. alternifolium, *Wall. Cat. n.* 289. *Hook. l. c p.* 81

Hab. In the moist forests of Assam and Sylhet, the Malayan Peninsula, and the Islands of the Pacific; introduced to the Botanic Gardens from the Moluccas in 1798.

47 P. (*Phymatodes*) Phymatodes *Linn. Mant. p.* 360. *Hook. l. c. p.* 82. *Bedd. Ferns of South India,* 57. *t.* 173.

Hab. Very widely dispersed in the tropical countries of the Old World, though rare in the Indian Continent; introduced to the Botanic Gardens from Singapore in 1862.

48. P. (*Phymatodes*) dilatatum, *Wall. Cat. n.* 295. *Hook. l. c. p* 85. *Bedd Ferns of British India, t.* 122.

Hab In moist ravines, in the Eastern Himalaya, Eastern Bengal and the Malayan Peninsula; introduced from Seetakoond, near Chittagong in 1866

49. P. (*Phymatodes*) capitellatum, *Wall. Cat n.* 306. *Hook. l. c. p.* 90. *Bedd. Ferns of British India,* 12. *(in part) t.* 12.

Hab. On trees in the temperate forests of the Himalaya; introduced from Sikkim in 1867.

50. P. *(Phymatodes)* Himalayense, *Hook. l. c. p.* 91. P. venustum. *Wall Cat. n.* 305. (*not Desv*).

Hab. Climbing on trees in the temperate forests of the Eastern Himalaya; introduced from the Khasia Hills in 1867.

51. P. (*Phymatodes*) leiorhizon, *Wall. Cat. n.* 303. *Hook. l. c. p.* 91. *Bedd. Ferns of South India,* 58. *t.* 174.

Hab. On trees in the moist forest regions of the Himalaya, and in the Western Peninsula; introduced from Sikkim in 1867.

j. Drynaria.

52. P. (*Drynaria*) coronans, *Wall. Cat. n.* 288. *Hook Sp. Fil.* 5. *p.* 95. *Bedd. Ferns of South India,* 13. *t.* 13.

Hab. In the tropical and subtropical forests of the Himalaya,—epiphytic, the thick rhizome encircling in dense horizontal masses the trunks of trees, and giving off a magnificent corona of erect, uniform fronds. It was introduced to the Botanic Garden from Sikkim in 1867.

53. P. *(Drynaria)* quercifolium, *Linn. Sp. Pl. p.* 1547. *Icon. Roxb.* 15 *t.* 96. *Bedd. Ferns of South India,* 63 *t.* 187.

Hab. Very abundant in the Indian Continent, and Ceylon, the Malayan Peninsula and Islands: also in Java and Tropical Eastern Australia; indigenous in the Botanic Gardens, and very common on Mango and other trees in the vicinity of Calcutta.

54. P. (*Drynaria*) propinquum, *Wall. in Herb.* 1823 *Cat. n.* 293. *Hook. l. c. p.* 97. *Bedd. Ferns of British India, t.* 160.

Hab. On trees and rocks in the subtropical regions of the Himalaya: also in Tropical Africa; introduced from Sikkim in 1867.

k. Dipteris.

55. P. (*Dipteris)* Wallichii, *Br. in Hook. and Grev. Ic. Fil t.* 1689. *Wall. Cat. n.* 287. Polyp. macrochurus, *Wall.*

Herb. Hook. Sp. Fil. 5. *p.* 99. *Bedd. Ferns of British India, t.* 80.

Hab. In the humid tropical and subtropical forests of Sylhet, Khasia, Assam, and Bhotan. A rare and magnificent fern; has a stout, creeping, freely branching rhizome, sending up a profusion of fronds. the stipes of which are scarcely thicker than a Swan's quill and at times over four feet high, with repeatedly dichotomous fan-shaped fronds, varying from one to two and a half feet in length, and from one to three and a half feet in breadth. The Gardens are indebted to Mr. A. Biermann, of the Government Cinchona Nurseries, Khasia Hills, for several large plants of this fine fern, which arrived here in March last.

56. P. *(Dipteris)* Horsfieldii, *Br. in Wall. Cat. n.* 286. *Hook. l. c. p.* 99.

Hab. In the damp forests of Singapore, and in several of the Malayan and Pacific Islands Very similar in general appearance to *P. Wallichii*, but readily distinguished by the serrated and more acuminated segments, and the absence of the gum-resin which surrounds the sori in the other species. The plants in the Botanic Gardens were received from the Botanic Gardens, Buitenzorg, Java in 1867.

57. P. *(Dipteris)* Lobbianum, *Hook. in Kew Gard. Misc.* 5. *p.* 300. *t.* 11. *and Sp. Fil.* 5. *p.* 100. *Bedd. Ferns of British India, t.* 233.

Hab. In Mount Ophir, Malacca, and Sarawak, Borneo: this extremely rare and elegant fern was sent to the Botanic Gardens from Mount Ophir, by Dr. A. C. Maingay, Civil Surgeon, Malacca, in 1867.

l. Dictyopteris.

58. P. *(Dictyopteris)* tenerifrons, *Hook. Sp. Fil.* 5. *p.* 104. *Bedd. Ferns of British India, t.* 4.

Hab. In shady forest ravines in Eastern Bengal, Moulmein (among limestone rocks): also by the Gaboon River, West tropical Africa; introduced from Seetakoond Hill near Chittagong in 1866.

Subordo, 9.—GRAMMITIDEÆ.

1. GYMNOGRAMME, DESV.

a. Eugymnogramme.

1. G. (*Eugymnogramme*) Javanica, *Bl. Fil. Jav. p.* 95. *t.* 41. *Hook. Sp. Fil.* 5. *t.* 146.

var. β. serrulata, G. serrulata, *Bl. Fil. Jav. p.* 95. *t.* 42. *Bedd. Ferns of South India*, 77, *t.* 232.

var. γ. microphylla.

Hab. Throughout the temperate regions of the Himalaya, and also in their tropical valleys, in Ceylon, the Malayan Peninsula and Islands. Also in Japan, the Sandwich Islands, and in Tropical West Africa, on mountains at a considerable elevation. *Var. a.* was introduced from the valley of the Rungbee, and from above Punkabaree, Sikkim in 1867 (from elevations of 1800 and 5000 ft.); *var.* β. from the Khasia Hills in 1868; and *var.* γ. from Sinchal, Darjeeling in 1868, from an elevation of 6,000 ft.

b. Ceropteris.

2. G. (*Ceropteris*) calomelanos, *Klf. En. Fil. p.* 76. *Hook. l. c. p.* 148.

Hab. Throughout Tropical America, and the West Indian Islands; received from the Botanic Gardens, Buitenzorg, Java in 1867.

c. Stegnogramme.

3. G. (*Stegnogramme*) aspidioides, *Hook. Gen. Fil. t.* 120. *and Sp. Fil.* 5. *p.* 150. *Bedd. Ferns of South India, p.* 78.

Hab. In the moist, subtropical forest regions of Eastern Bengal, Ceylon and Java; introduced from the Khasia Hills in 1868.

d. Selliguea.

4. G. (*Selliguea*) involuta, *Don. Prodr. p.* 14, Grammitis flavescens, *Wall. Cat. n.* 6. G. acuminata, *Wall. Cat. n.* 7. G. macrophylla, *Wall. Cat. n.* 10. *(not Blume) Hook. Sp. Fil.* 5. *p.* 155.

Hab. Very abundant on trees in the temperate and subtropical forests of the Himalayas, in the Western Peninsula, Ceylon, the Malayan Peninsula and Islands; introduced from Sikkim and the Khasia Hills in 1867.

5. G. (*Selliguea*) decurrens, *Hook. and Grev. Ic. Fil. t.* 5. Grammitis decurrens, *Wall. Cat. n.* 5. *Hook. Sp. Fil.* 5. *p.* 161. *Bedd. Ferns of British India, t.* 150.

Hab On trees in the damp subtropical forests of the Himalaya mountains and about Moulmein; also in China, Japan and Hong-Kong; introduced from the Khasia Hills in 1868.

2. BRAINEA, HOOK.

1. B. insignis, *Hook. Kew. Gard. Misc.* 9. *p.* 354. *and Sp. Fil.* 5. *p.* 162.

Hab. In Eastern Bengal and Hong-Kong, introduced from the Khasia Hills in 1868.

3. MENISCIUM, SCHREB.

1. M. serratum, *Cav. Prælect.* 1803. *p.* 548? *Hook. Sp. Fil. p.* 165.

Hab. In Tropical America; received from the Royal Gardens Kew in 1867.

4. ANTROPHYUM, KLFS.

1. A. coriaceum, *Wall. Cat. n.* 43. Solenopteris lanceolata, *Wall. Cat. n.* 43. *Hook. Sp. Fil.* 5. *p.* 169.

Hab. On trees in dense tufts in the temperate forests of Nipal and Khasia: introduced from the Khasia Hills in 1868.

5. VITTARIA, SM

a. Tæniopsis, J. Sm.

1. V. (*Tæniopsis*) lineata, *Sw. Syn. Fil. p.* 109. *Icones Roxb. t.* 109. *and Cal. Jour. Nat. Hist. v.* 4. *p.* 509. *Hook. Sp. Fil.* 5. *p.* 180.

Hab. On trees in the subtropical and temperate forests of the Himalaya, in the Malayan Peninsula and Borneo: also in a few localities in Tropical Africa, and very generally dispersed over Tropical America; introduced from Sikkim in 1867.

b. Euvittaria.

2. V. (*Euvittaria*) rigida, *Klfs. En. Fil. p.* 193. Pteris graminifolia *Roxb. Icones* 15. *t.* 104. *f.* 3. and P. angustifolia *f.* 2.; *Hook. l. c. p.* 184.

Hab On trees in the Eastern Himalaya, Eastern Bengal, and the Malayan Peninsula: also in Mauritius, Bourbon, Java and the Tropical East coast of Australia; introduced from the Soonderbunds in 1867

6. DRYMOGLOSSUM, P.

1. D. carnosum, *Hook. Gen. Fil. t.* 78 Nothoclæna carnosa, *Wall. Cat.* 131. *and* 138. *Hook. Sp. Fil.* 5. *p.* 189.

Hab. On trees, abundant in the Eastern Himalaya, North China and Japan; introduced from Sikkim in 1867.

2. D. piloselloides, *Presl. Tent. Pterid. p.* 227. Pteris piloselloides, *Roxb. Icones,* 15. *t.* 104. *f.* 1. *and Cal. Jour. Nat. Hist.* 4. 503. Nothoclæna piloselloides, *Wall. Cat. n.* 139. *Hook. l. c. p.*

Hab. On trees in the forests of Eastern Bengal, Malayan Peninsula and Islands, the Western Peninsula and Ceylon; introduced from Chittagong in 1866.

7. HEMIONITIS LINN.

1. H. cordata, *Roxb. Icones.* 15. *t* 103. *in Wall. Cat. n.* 44. *and in Cal. Jour. Nat. Hist.* 4. *p.* 500. (H. cordifolia.) *Bedd. Ferns of South India,* 18. *t.* 53.

Hab. In damp shady localities about Calcutta, Eastern Bengal, Moulmein, the Western Peninsula and Ceylon; indigenous in the Botanic Gardens.

Subordo, 10.—ACROSTICHEÆ.

1. ACROSTICHUM, LINN.

a. Elaphoglossum.

1. A. (*Elaphoglossum*) conforme, *Sw. Syn. Fil. pp.* 10. *and* 102. A. marginatum, *Wall. Cat. n.* 17. *Hook. Sp. Fil.* 5. *p.* 198.

Hab. On trees in the Eastern Himalaya, Western Peninsula, Ceylon: also in Java, South Africa, and Tropical America; received from the Royal Gardens Kew in 1867.

2. A. (*Elaphoglossum*) latifolium, *Sw. Fil. Ind.* 3. *p.* 1589. *Hook l. c. p.* 202.

Hab. In tropical America and the West India Islands; received from the Royal Gardens Kew in 1867.

3. A. (*Elaphoglossum*) viscosum, *Sw Syn Fil. p* 10. *and* 193. *Wall. Cat. p.* 15. and A. neriifolium *n.* 16. *Hook. l. c. p.* 220.

Hab. On trees in the subtropical forests of the Eastern Himalaya, the Western Peninsula and Ceylon: also in Java, Tropical Africa, America, and the West Indian Islands; introduced from Sikkim in 1867.

b. Stenochlæna.

4. A. (*Stenochlæna*) scandens, *J. Sm. in Hook. Jour. Bot.* 4. *p.* 149. Pteris scandens, *Roxb Icones.* 15. *t.* 107. *and Cal. Jour. Nat. Hist.* 4. *p.* 505. Lomaria limonifolia, *Wall. Cat. n.* 30. *and* Davallia achillæfolia, *n.* 248. *Hook. Sp. Fil.* 5. *p.* 249. *Bedd. Ferns of South India,* 68. *t.* 201.

Hab. On trees and rocks in Eastern Bengal, the Western and Malayan Peninsula, Ceylon, Java and China; though not indigenous in the vicinity of Calcutta it thrives well on trees in the Botanic Gardens, especially so under the shade of the great Banyan, many of the adventitious roots of which, its surculose rhizome encircles, and clothes with a profusion of handsome, pendulous, pinnated fronds

c. Egenolfia.

5. A. (*Egenolfia*) appendiculatum, *Willd. Sp. Pl.* 5. *p.* 114. A. Hamiltomanum, *Wall. Cat. n.* 29. A. viviparum, *n.* 28 and A. setosum *n.* 30. *Hook. l. c. p.* 251. Polybotrya appendiculata, *Hook., Bedd. Ferns of British India, t.* 110.

Hab. In the mountain districts of India, very abundant; introduced from Chittagong in 1866, and Sikkim in 1867.

d. Olfersia.

6. A. (*Olfersia*) cervinum, *Sw. Syn. Fil. p.* 14 *and* 200, *Hook. Sp. Fil.* 5. 254.

Hab. In Tropical America; received from the Royal Gardens Kew in 1867.

e. Heteroneuron.

7. A. (*Heteroneuron*) flagelliferum, *Wall. Cat. n.* 25. *Hook Sp Fil.* 5. 258 *Bedd Ferns of British India, t.* 112.

Hab. In the tropical forests of the Eastern Himalaya, Eastern Bengal and Java; introduced from Sikkim in 1867.

8. A. (*Heteroneuron*) virens, *Wall. Cat. n.* 1033 A. terminans, *Wall. Cat. n.* 2168. A. contaminans *Wall. Cat. n.* 22. *Hook. l. c. p.* 261.

var. crispatulum, *Hook.* A. crispatulum, *Wall. Cat. n.* 204.

Hab. Throughout the subtropical forests of the Himalaya, Eastern Bengal, the Nilghiris, and Ceylon: also in Tropical Africa. The different forms of this species were introduced from Sikkim, and the Khasia Hills in 1868.

9. A. (*Heteroneuron*) costatum, *Wall. Hook. l. c. p.* 262.

var. α. rubicundum, A. costatum, *Wall. Cat. n.* 26. *Bedd. Ferns of British India, t.* 113

var. β. deltigerum, Meniscium deltigerum, *Wall. Cat. n.* 59. *Bedd Ferns of British India, t.* 114.

var. γ. undulatum, Nothochlæna undulata, *Wall. Cat. n.* 140. *Bedd. Ferns of British India, t.* 115.

Hab. In the subtropical and tropical forests of the Eastern Himalaya, Eastern Bengal, and Tenasserim, a very polymorphic species. *Var. α.* was introduced to the Botanic Gardens from Chittagong in 1866, *β.* from Sikkim in 1867, and *γ.* from the Khasia Hills in 1868.

f. Chrysodium.

10. A. (*Chrysodium*) aureum, *Linn. Sp. Pl. p.* 1525. Acrostichum emarginatum, *Buch ; Icones Roxb.* 15. *t.* 91.

and Cal. Jour. Nat. Hist. 4. 480. *Hook. Sp. Fil.* 5. 266. *Bedd. Ferns of South India,* 69. *t.* 204.

Hab. Very widely dispersed over the tropical and subtropical zones of both Hemispheres. In India it is generally found in damp, swampy habitats, on the banks of tidal rivers &c., abundant in the Delta of the Ganges, whence it was introduced many years ago to the Botanic Gardens.

g. Gymnopteris.

11. A. (*Gymnopteris*) Zollingerii. Hemionitis Zollingeri, *Krz.* (*Cat. Bot. Gard. Buit. p.* 2.)

Hab. In Java; received from the Botanic Gardens, Buitenzorg, Java in 1867.

h. Leptochilus.

12. A. (*Leptochilus*) lanceolatum, *Hook. Sp. Fil.* 5. 270. Osmunda lanceolata, *Roxb Icones* 15. *t.* 89. *and Cal. Jour. Nat. Hist.* 4. 479.

Hab. In the Western Peninsula, Ceylon, Tenasserim and the Malayan Peninsula; introduced from Singapore in 1860.

13. A. (*Leptochilus*) variabile, *Hook. l. c. p.* 277. A. rivulare, *Wall. Cat. n.* 2165.

Hab. In the moist tropical forests of Assam and Khasia, in Penang, Ceylon and Java; introduced from the Khasia Hills in 1868.

2. PLATYCERIUM, DESV.

1. P. Wallichii, *Hook. in Gard. Chron. p.* 765. (1858) *and in Sp. Fil* 5. 284. A. alcicorne, *Wall. Cat. n.* 19.

Hab. On trees in Tenasserim and the Malayan Peninsula; introduced to the Botanic Gardens from Moulmein in 1860.

Subordo, 11.—SCHIZÆENEÆ.

1. LYGODIUM, SW.

1. L. circinatum, *Sw. Syn. Fil. p.* 153. *Thw. Enum. Plt. Zey. p.* 379.

Hab. In thickets in the Malayan Peninsula and Islands, and in Java; received from the Botanic Gardens Buitenzorg, Java in 1867.

2. L. flexuosum, *Sw. l. c. p.* 153. Ophioglossum — ? *Icon., Roxb.* 15. *t.* 87. L. flexuosum *Bedd. Ferns of South India, t.* 63.

Hab. Scandent, on shrubby underwood in the tropical Himalayas, Bengal, the Western Peninsula, Malayan Peninsula and Ceylon: indigenous in the Botanic Gardens and not uncommon in the surrounding thickets.

3. L. scandens, *Sw. l. c. p.* 152. Ophioglossum filiforme, *Roxb. Icones.* 15. *t.* 86. *Benth. Fl. Hongk. p.* 441.

Hab. In Ceylon, the Western Peninsula, Malayan Peninsula and Islands, and Java; introduced from Singapore in 1867.

4. L. Japonicum, *Sw. l. c. p.* 154. *Bedd. Ferns of South India, t.* 64.

Hab. In the forest underwood of the tropical and subtropical Himalayas, Bengal, Western Peninsula, Burmah, Malayan Peninsula, China and Japan; indigenous in the Botanic Gardens, and common in thickets in the vicinity of Calcutta.

Subordo, 12.—MARATTIACEÆ.

1. ANGIOPTERIS, HOFFM.

1. A. evecta, *Hoffm. in comment. Gotting.* 12. *p.* 29. *t.* 5. *Sw. Syn. Fil. p.* 166. *and* 395. *J. Sm. Ferns, British and Foreign p.* 268.

Hab. In Ceylon, the Western Peninsula, the temperate and tropical forests of the Himalaya (attaining in moist localities most gigantic proportions), in Eastern Bengal and Southward through the Malayan Peninsula. Also in the Islands of the Pacific Ocean; introduced from Chittagong in 1866, and Sikkim in 1867.

2. A. *Sp.*

Hab. Islands of Ternate; received from the Botanic Gardens Buitenzorg Java in 1867.

2.—MARATTIA, Sm.

1. M. purpurascens, *De. Vr. Mar.*; *Hook. Fil. Exot. t.* 65. *J. Sm. Ferns, British and Foreign p.* 266.

Hab. Islands of Ascension; received from the Royal Gardens Kew in 1867.

3.—KAULFUSSIA, Blume.

1. K. æsculifolia, *Bl. Enum. Pl. Jav. fasc.* 2. *p.* 260. *Hook. et. Grev. Ic. Fil. t.* 229. *Hook. Gen Fil. t.* 59. *a.*

Hab. In Java and the Philippine Islands; received from the Botanic Gardens Buitenzorg Java in 1867.

2. K. assamica, *Griff. Asiat. Res. v.* 19. *p.* 108. *Hook. Jour.* 2. 375. (1840) *and. Gen. Fil. t.* 59. *t. a.*

Hab. In Upper Assam, and the Khasia Hills; introduced from the latter in 1868.

Subordo, 13.—OPHIOGLOSSACEÆ.

1. Botrychium.

1. B. subcarnosum, *Wall. Cat.* 49. *Moore Ind. Fil. p.* 212 *Bedd. Ferns of South India, t.* 68.

Hab. In damp, clayey places in the temperate forests of the Himalaya, in the Nilghiris, Ceylon and Java, introduced from Sinchal, Darjeeling in 1867.

2. B. virginicum, *Willd. Sp. Pl.* 564. *var.* B. lanuginosum, *Moore Ind. Fil. p.* 213. B. lanuginosum, *Wall. Cat. n.* 48. Osmunda lanuginosa, *Wall. Herb., Bedd. Ferns of South India, t.* 67.

Hab. Throughout the temperate forests of the Himalaya, and in the Mountains of the Western Peninsula; introduced from Sinchal, Darjeeling in 1867.

2.—HELMINTHOSTACHYS. Kaulf.

1. H. Zeylanica, *Hook. Gen. Fil. t.* 47. *and Gard. Ferns t.* 28. Osmunda Zeylanica, Botrychium Zeylanicum, *Sw. Syn. Fil. p.* 172. *Linn. Sp. Pl.* 1519. *Icon. Roxb.* 15. *t.* 88. *and*

Cat. Jour. Nat. Hist. p. 478. *Bedd. Ferns of South India,* 23. *t.* 69.

Hab. In wet, clayey places in Eastern Bengal, the Western Peninsula, (Anamallys, moist bamboo clumps in the Teak forest, 2000 to 3000 feet elevation, *Bedd.*) Ceylon (on the borders of Paddy fields, *Thw.*) and many of the Islands of the Pacific Ocean; received from the Botanic Gardens, Buitenzorg, Java in 1867.

3.—OPHIOGLOSSUM.

1. O. vulgatum, *Linn.* O. cordifolium. *Roxb. Icones.* 15. *t.* 85. *and Cal. Jour. Nat. Hist.* 4. *p.* 475. *Hook. Fil. Fl. N. Zeal.* 2. *p.* 50.

Hab. In the tropical and temperate regions of both hemispheres: indigenous in damp grassy places in the Botanic Gardens.

Ordo, 2.—LYCOPODIACEÆ.

1. LYCOPODIACEÆ, LINN.

a. Selago.

1. L. (*Selago*) obtusifolium, *Ham. Mss.*; *Don. Prod. Nep. p.* 18.

Hab. On trees and rocks in the subtropical and temperate regions of the Eastern Himalaya, and on Parasnath from 6,000 feet to the summit; introduced from the Khasia Hills, and Parasnath in 1868.

2. L. (*Selago*) Hamiltonii, *Spr.*; L. obtusifolium, *Wall. Cat.*

Hab. On trees and rocks, in the Sikkim Himalaya, and the Khasia Hills; introduced from Nunklow, Khasia in 1868.

3. L. (*Selago*) serratum, *Thunb. Fil. Jap. t.* 38. *Hook. et. Grev. Ic. Fil. v.* 1. *t.* 37.

Hab In the tropical vallies of the Sikkim Himalaya, in the Malayan Peninsula and Japan; introduced fram Sikkim in 1868.

4. L. (*Selago*) ulicifolium, *Vent. in Sw. Syn. Fil. p.* 177.

Hab. On trees and mossy rocks, in the humid subtropical forests of the Sikkim Himalaya and the Khasia Hills; introduced from Sikkim in 1868.

5. L. (*Selago*) pinifolium, *Bl.*

Hab. On trees, in the Mountain forest regions of Java; received from the Botanic Gardens Buitenzorg, Java in 1867.

b. Lepidotis.

6. L. (*Lepidotis*) phlegmaria, *Linn.* (*Willd. Sp. Pl.* 5. *p.* 10.) L. mirabile, *Willd. l. c.; Icon. Roxb.* 151. 84.

Hab. On trees and moist rocks, frequent throughout the Tropics of the Eastern Hemisphere; introduced from the Soonderbunds in 1867.

7. L. (*Lepidotis*) nummularifolium, *Blume. Enum. Pl. Jav. f.* 2. *p.* 263. L. rotundifolium, *Roxb. Cal. Jour. Nat. Hist.* 4. 473. *Wall. Cat. n.* 2183. *Hook., et. Grev. Ic Fil.* 2. *t.* 212. *and Bot. Misc. v.* 2. *p.* 370.

Hab. Epiphytal, Java and Sumatra; received from the Botanic Gardens Buitenzorg, Java in 1867.

8. L. (*Lepidotis.*) Hookerii, *Wall. Cat. n.* 146. L. pulcherrimum *Wall. in Herb.* 1823. *Hook. et. Grev. Ic. Fil.* 2. *t.* 185.

Hab. On trees in the tropical and temperate regions of the Eastern Himalaya; introduced from Sikkim in 1865 and again in 1867.

9. L. (*Lepidotis.*) carinatum, *Desv.*

Hab. Epiphytal Java; received from the Botanic Gardens Buitenzorg, Java in 1867.

10. L. (*Lepidotis.*) cernuum *Linn.; Spring. Monogr. Lycop.* 1. 79. *and* 2. 37.

Hab. Epigeous, frequent throughout the tropical and subtropical regions of both Hemispheres; introduced from Sikkim in 1867.

2. SELAGINELLA, Spring.

a. Stachygynandrium.

1. S. (*Stachygynandrium*) rupestris *Spring. Mon. Lycop. part.* ii. *p.* 55.

Hab. Forming dense tufts on rocks in the Khasia Hills, Parasnath, and Ceylon. It is also found in South Africa, Kamschatka, Siberia and North America; introduced from Parasnath (where it forms dense springy cushions on the rocks at an elevation of from 4,000 ft. to the summit) in 1868.

b. Diplostachyum.

2. S. imbricatum; Lycopodium imbricatum, *Roxb. Crypt. Plts. Cal. Jour Nat. Hist. v. 2. p.* 475.

Stems trailing, or suberect slender irregularly and sparingly branched. *Distichous leaves* lax, distant, obliquely ovate, acute or oblong-falcate, margin ciliated, from 1 to 2 lines long. *Stipuliform leaves*, ovate cuspidate and about ⅓ shorter than the former. *Spikes* ¼ to ½ an inch long, laxly tetragonous, bracts near ⅓ longer than the capsules, carinate, ovate-cuspidate.—

Var. α, normale, *Stems* wide-trailing copiously rooting; *distichous leaves* obliquely ovate-acute.

Var. β. erectum, *Stems* acending, irregularly and sparingly sending off short branches; rootlets confined to the base; *distichous leaves* obliquely, oblong falcate.

Hab. In moist shady localities on rocks, Bahar; Behar, as at Gyra, on the Grand Trunk Road, and on Parasnath at elevations of from 4,000 ft to the summit, where it is abundant with the *S. rupestris*, Spring; introduced from Parasnath in 1868. *Var. β.* a form naturalised in the Palmetum of the Botanic Gardens, where its duration is annually regulated, by, and limited to the rainy season.

The normal form of this species almost passes into *S. denticulata, Link.* differing chiefly in the more slender habit, obliquely ovate, ciliated, not denticulate leaves, and the short lax, tetragonous spikes.

3. S. denticulata, *Link. Spring. Mon.* 2. *p.* 82.

Hab. South of Europe; introduced accidentally in a case of plants from the Royal Gardens Kew in 1868.

4. S. uncinata, *Spring. l. c.* 2. *p.* 109. S. cæsia, *Hook.*

Hab. In China; introduced by Fortune in 1849.

5. S. atroviridis, *Spring. l. c* 2. *p.* 124. Lycopodium atroviride, *Wall. Herb.* 1823. *Hook. et. Grev. Ic. Fil. t.* 39.

Hab. In the Indian Peninsula; Ceylon, the Himalayas, Eastern Bengal, Malayan Peninsula, and Archipelago: also in China; introduced from the Khasia Hills, and Chittagong in 1867

6. S. Pouzolziana, *Spring.*

Hab. In Java: received from the Botanic Gardens Buitenzorg, Java, in 1867.

7. S. intermedia, *Spring.*

Hab. In Java; received from the Botanic Gardens Buitenzorg, in 1867.

8. S. lævigata, *Spring. l. c.* 2. *p.* 137. Lycopodium lævigatum, *Willd.* Lycop. Willdenovii *Desv. Hook et. Grev. Ic Fil. v.* 1. *t.* 57, S. altissima, *Klot.* S. cæsia, *var.* arborea, *Hort* Lycopodium cæsium, *Firmingers Indian Gardening p.* 291.

Hab. In the Malayan Peninsula, and Java. Has been long cultivated in the Botanic Gardens, and is one of the few species which thrives well under the shade of trees in the vicinity of Calcutta. It is in general cultivation in Calcutta Gardens under the names of *Lycopodium bicolor*, and *L cæsium*

9. S. caudata, *Spring l. c. p.* 139. Lycopodium caudatum *Desv.*; *Benth. Fl. Hongk. p.* 437.

Hab. In Ceylon, the Malayan Peninsula, Java, China, and Hongkong; received from the Botanic Gardens Buitenzorg, Java, in 1866.

10. S. stolonifera, *Spring. l. c. p.* 209. Lycop. Stoloniferum *Sw*; *Dill. Hist Musc. t* 67. *f.* 10.

Hab In the tropical forests of the Khasia Hills and Ceylon; also in the West Indies; introduced from the Khasia Hills in 1868.

11. S. semicordatum; Lycop. semicordatum, *Wall. Cat. n.* 137. *L* canaliculatum ? *Herb. Hamilt.*

Stems 2-8 in. ascending or erect, irregularly or sparingly branched or fastigiate. *Distichous leaves* imbricated upwards, subdistant below: oblong-falcate, acute, slightly ciliated. *Stipuliform leaves,* ovate-acuminate, *Spikes* short, secund. *Sti-*

puliform bracts alone fertile, those corresponding with the distichous leaves scarcely altered, and nearly twice the length of the former.

Hab. Throughout the Eastern Himalaya, in Behar (on Parasnath to elevations of 2,500 ft.) and Burmah; introduced from Parasnath in 1868.

12. S. implexa; *nov. sp.*

Stems erect dimorphously leafy, 2-8 in. high, producing from the base short, epigeal stolons, simple for 1-2. in. then expanding in an ovate. lanceolate form; branches pinnate or sub-pinnate. *Distichous leaves* obliquely oblong-lanceolate, slightly falcate, midrib conspicuous, base of inferior margin ciliated. *Stipuliform leaves* obliquely-ovate, acute, adpressed with divergent points. *Spikes* 2-6 lines long; *bracts* twice as long as the capsules, ovate, acuminate, carinate, laxly imbricated, and tetragonous.

This species which I believe has not been described, has perhaps its nearest affinity in the South American, *S. viticulosa, Klot.* or the Bornean *S. Griffithia*, *Spring.* From the latter however it is readily distinguished by the general habit and form of the distichous leaves; and from the former in the less compound habit, form of stipuliform leaves, and the short stout tetragonous spikes. In the Herbarium of the Botanic Gardens there are specimens of this species from Parasnath at 2,000 ft. elevation, Bheerboom and the Hills near Balasore, introduced from Parasnath in 1868.

13. S. caulescens, *Spring. l. c. p.* 158. Lycop. caulescens *Wall.*

Hab. Frequent in the tropical and temperate forests of the Eastern Himalaya, in the Malayan Peninsula, Ceylon and Java; introduced from Sikkim in 1864.

14. S. aristatum; Lycop, aristatum, *Roxb. Crypt. Plt. Cal. Jour. Nat. Hist. v* 4. *p.* 473.

Habit laxly rosulate; *stems* slender, dichotomously pinnate, 1-3 inches long. *Distichous leaves*, laxly imbricated, of a herbaceous texture, obliquely—ovate, falcate, acute, or shortly aristate; midrib excentric; margin, scariose, ciliated. *Stipuliform leaves* smaller and more acute. *Spikes* copious, lax and tetragonous; *bracts* very similar to the stipuliform leaves.

This interesting little species, according to Roxburgh, was introduced to the Botanic Gardens in 1812. and is now throughly naturalised as a rainy season annual; appearing—as in the case of the *S. imbricatum*—at their commencement and completing its duration of existence ere their close.

3. PSILOTUM, Sw.

1 P. triquetrum, *Sw. Hook. Gen Fil.* 1. *t. Fil. Exot. t.* 63. Lycopodium nudum, *Linn.*

Hab. In the more humid tropical and subtropical regions of both hemispheres; received from the Botanic Gardens Buitenzorg, Java in 1867.

Ordo. 3 —MARSILEACEŒ, Br.

1. MARSILEA, LINN.

1. M. quadrifolia, *Linn. Willd. Sp. Pl. v. p.* 538. *Roxb. H. B. p.* 75. *J. Grah. Cat. B. Pl. p.* 243.

Hab. Margins of fresh water lakes, &c. in both Peninsulas, Ceylon, Java, Australia, N. Africa, and Europe; indigenous in the Botanic Gardens.

It is the "Soosni-shak"* of the natives of Bengal from the Hindustani, "*Sona*" to sleep, and the Bengalee "*shak*"—a vegetable—so called in allusion to its reputed soporific qualities. A favourite remedy, with the natives for their children, when a sedative is required; the expressed juice being then administered in quantities of about half a tea spoonful. When used by adults with the above view the leaves are first boiled in water then stewed in mustard oil and eaten with a little salt. By the poorer class of natives the leaves are also used in their curries but they never, in so far as I can hear, use the spores and spore-cases as in the case of the "*Nardoo*," *Marsilea macropus, Hook.*, with the aborigines of Australia.

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* When I first heard the native name of the plant, it naturally occured to me that it had reference to its own vigils,—the leaflets of which, as is well known, close in the evening. But intelligent natives assure me that it has purely reference to the properties of the plant.

2. AZOLLA, Lam.

1. A. pinnata, *Br .Prod. p.* 167. Salvinia imbricata, *Roxb. Crypt. Plts. Cal. Jour. Nat. Hist. v.* 4. *p.* 470. *Moore Ind. Fil. p.* 109.

Hab. Floating on the surface of ponds &c.; in Bengal very common, accomodating itself to the conditions of the dryer parts of India—as in the rice fields of Behar, which are dry and parched for many months of the year—where its ordinary congeners, Salvinias and Lemnas have disappeared: also in Madagascar and New Holland. It is the true "*Ulki—pana*" of the natives of Bengal, and so called from its resemblance to a sectarial mark, on the forehead of Hindu women.

3.—SALVINIA, Mich.

1. S. verticillata, *Roxb. Crypt. Plts. Jour. Nat. Hist. v.* 4. *p.* 469.

Hab. Floating on stagnant water in the Lower Gangetic plain, Eastern Bengal, and Burmah.

This is the "*Ulki-pana*" of *Roxb. Crypt. Plts. l. c.* but I believe mistakingly so, though repeated in *Voigt's Hort. Sub. Cal.*—generally correct in references to native names. It has no resemblance to the characteristic mark, and I have always had the *Azolla pinnata*—which certainly has—shown me as the "*Ulki*" by the Botanic Garden mallees, and others to whom it is familiar.

2. S. cucullata, *Roxb. Crypt. Plts. l. c. p.* 470. *Wall. Cat. n.* 399.

Hab. Floating on stagnant waters throughout Bengal, and the Tenasserim coast.

It is the "*Indoor—kana—pana*," of the Bengalees, from *indoor*, a rat, *kana*, the ear, and *pana*, a water weed; in allusion to the resemblence of its cucullate leaves to the ears of the common Bengal rat.

EQUISETACEÆ.

1. Equisetum, *Linn.*

1. E. debile, *Roxb. H. B. p.* 75. *E. pallens, Wall. Cat. n.* 397.

Hab. In swampy thickets in Bengal, and the Eastern Peninsula; indigenous near Calcutta.

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OF
INDIA.

List of Acanthaceæ cultivated in the Royal Botanical Gardens, Calcutta.—*By* T ANDERSON M. D. F. L S. *Superintendent of the Royal Botanical Gardens.*

THUNBERGIA, *Linn. Fil*

SECT. 1.

Calyx consisting of an undivided fleshy ring round the base of the ovary

SERIES A

Species with blue flowers. (3 species have white flowered varieties)

I Climbers. (Indian species)

1. T. GRANDIFLORA, *Roxb. Fl. Ind. III p.* 34. Bot Mag. t. 2366.

A climbing plant common in the mountainous parts of India, especially in the Himalaya, extending to Assam and the Khasia Hills.

A variety with white flowers is abundant in Sikkim

2. T. LAURIFOLIA, *Lindl. Gard. Chron.* 1856 *p.* 260.

S. Harrisi, Hook. Bot. Mag. t. 4998.

A species closely allied to the preceding one but differing in the shape of the leaves. It is confined to Arracan, Burmah, Tenasserim provinces and the Andaman islands.

3. T. HAWTAYNII, *Wall. Tent. Fl. Nepal.* I. *t.* 49.

T. Hawtayneana, Paxt. Mag. VI *p.* 147.

A very beautiful species a native of the mountains of Southern and Western India and Ceylon. A variety with white flowers occurs on the Nilgiris.

II. Small erect shrubs. (African species.)

4. T. VOGELIANA, *Benth. Fl. Nigrit. p,* 475 *Meyenia Vogeliana.* Hook. Bot. Mag. t. 5389.

A native of Fernando Po; received from the Royal Gardens Kew in 1864.

5. T. ERECTA, *T. Anders. in Linn.* Soc. *Journ,* VII. *p.* 18.

Meyenia erecta, Benth. Bot. Mag. t. 5013.

Found by Dr. Vogel only at Cape Coast Castle in Western Africa; received from the Royal Gardens Kew in 1859. A white flowered variety is cultivated in the Botanical Gardens.

SERIES B.

Species with orange or yellow flowers.

6. T. COCCINEA, *Wall. Tent. Fl. Nepal.* 1 p. 49, *et.* 58. *t.* 37. Hook. Exot. Fl. t. 95. Bot. Mag. t. 5124.

A common extensive climber in mountain woods in the Khasia Hills, Assam and the Himalaya from Bhotan westwards to Gharwal. In Sikkim it ascends to an altitude of 6,500 feet above the sea.

SECT. 2.

Calyx consisting of a circle of herbaceous erect teeth.

SERIES A.

Flowers white or pale yellow. (Indian species.)

7. T. FRAGRANS, *Roxb. Fl. Ind. III: p.* 33. Plant. Corom. I. t. 67. Andr. Repos. II. t. p. 123.

A native of the eastern and central regions of the Himalaya, of the mountains of Western and Southern India, Ceylon and the Tenasserim provinces; also of Java and the Philippine islands.

8. T. TOMENTOSA, *Wall. Pl. As. rar.* III. p. 78.

A local species found only in the Nilgiri mountains in subtropical forests as high as 6000 feet above the sea. The flowers of the plant cultivated in this garden are pale straw coloured. This species will probably prove to be a mountain state of the preceding one.

SERIES B.

Flowers yellow or buff coloured:

9. T. ALATA, *Bojer. in Hook. Exot. Fl. t.* 177 Bot. Mag. 2591.

A native of the South Eastern coast of Africa and adjoining islands. The normal colour of the corolla is dark buff with a deep purple ring round the apex of the tube. In variety *alba* Bot. Mag. t. 3512, Sweet's Fl. Gard t. 392, Paxt. Mag. III. t. 28, the flowers are white with a purple eye. A variety with a pale buff coloured corolla without any purple marking in the tube exists in this garden. Var: *Doodsii* Flore des. Serres IV. by 415. has the usual buff coloured purple eyed flowers but the leaves are beautifully variegated with white.

NELSONIA, *R. Br.*

N. CAMPESTRIS, *R. Br. Prodr. Fl. Nov. Holl. p.* 481.

A common weed throughout the tropics except in desert regions. Abundant as a weed in the Botanical Gardens.

EBERMAIERA, *Nees.*

E. VELUTINA, *Nees. in DC. Prodr. XI. p.* 76.

A small inconspicuous plant from the forests of the Tensserim provinces and the Andaman islands; introduced from the Andaman Islands in 1866.

ADENOSMA, *Nees.*

A. TRIFLORA, *Nees. in Wall. Pl. As. Rar. III. p.* 74.

A very variable aquatic weed, widely diffused throughout the delta of the Ganges and the jheels of Eastern Bengal and Assam; occurring also at Singapur. Indigenous in wet places in the Botanical Gardens.

BRILLANTAISIA, *Pal. de Beauv.*

B. HIRSUTA, *T. Anders. Mss.*

A new and undescribed species introduced into this garden from Kew. It is common on the banks of streams in Western equatorial Africa. It differs from *B. Owariensis* in its very prostrate habit, much smaller non decurrent leaves, and in the smaller size of its flowers which are not glandular.

HYGROPHILA, *R. Br.*

SECT. 1.

Flowers with 2 fertile stamens.

1. H. POLYSPERMA, *T. Anders. in Journ. Linn. Soc. IX. p.* 456.

A common weed in all the moister parts of India. Indigenous in the Botanical Gardens in wet places and on muddy gravel on the foot paths.

SECT. 2.

Flowers with 4 fertile stamens.

2. H. SALICIFOLIA, *Nees. in Wall. Plant. As. Rar. III. p.* 81.

A very variable widely diffused semi aquatic plant common by the sides of ponds and in marshy places. Indigenous in the Botanical Gardens in low lying wet places by the Hooghly. It varies much in habit, in the shape of the leaves and especially in the amount of pubsence. I have distinguished 2 extreme states var: *a*, glabra and var: *β*, hirsuta A lanceolate state of the leaves usually accompanies var: *a*, while var. *β*. has generally ovate or almost spathulate leaves.

3. H. SPINOSA, *T. Anders. in Thwaites Enumer. of Ceylon Plants p.* 225.

A very common plant in wet places in all parts of India from the base of the Himalaya to Ceylon and in Burmah; occurring also throughout tropical Africa.

The normal colour of the flowers is light blue but a pink flowered variety is not uncommon.

ECHINACANTHUS, *Nees.*

E. PARVIFLORUS, *T. Anders. in Jour. Linn. Soc. IX p.* 459.

On rocks in the tropical moist forests of the Khasia Hills and Sikkim. Introduced from Sikkim in 1868.

RUELLIA, *Linn.*

SECT 1. DIPTERACANTHUS, *Nees.*

Calyx 5 partite, seed vessel flattened and seedless below; club shaped, rounded and many seeded at the apex. Solitary flowers with 2 bracts in the axils of the leaves, rarely in 2 or 3 flowered verticillasters with a pair of common bracts.

1. R. REPENS, *Linn. Mant. p.* 89. Burm. Fl. Ind. t. 41.

In grassy places near sea, not yet observed on the continent of India but known only from Ceylon, the Malayan peninsula, Java, the Philippines and China.

2. R. PROSTRATA, *Poir. Enc. Méth.* vi. *p.* 349.

A common weed in shady places in all parts of tropical India, Ceylon and Burmah; it also occurs in Eastern Africa. Indigenous in the Botanical Gardens.

3. R. PATULA, *Jacq. Misc. II. p.* 358.

A native of the arid parts of Southern India and Ceylon; also of Arabia Felix and South Western Africa.

4 R. PARVIFLORA. *T. Anders. Dipteracanthus parviflorus* Nees. in DC. Prodr. XI. p. 123.

A native of Mexico, a low trailing weedy looking plant. Introduced from Europe in 1867.

5. R. CILIATA, *Hornem. Hort. Bot. Hafn. II. p.* 585.

A rare and very beautiful species, as yet found only by Dr. Wallich on mountains near Prome in Burmah.

6. R. AFFINIS, *T. Anders. Dipteracanthus affinis,* Nees. in DC. Prodr. xi. p. Bot. Mag. t. 5414.

A native of Brazil; introduced from the Royal Gardens Kew in 1867.

SECT. 11. APHRAGMIA, *Nees.*

Calyx deeply 5 partite. Seed vessel somewhat compressed in the elongated sterile portion: Apex, seed bearing, oval; 4—19 seeded. Flowers in spreading axillary or more or less terminal cymes; bracts foliaceous, at the base of the lower lateral flowers.

7. R. FASCICULATA, *Linn. Sp. Plant. p.* 885.

A common plant among bushes throughout the West Indian Islands and America from Mexico to Venezuela. Introduced into Calcutta from Kew in 1862.

STEPHANOPHYSUM, *Pohl.*

1. S. REPENS, *T. Anders. in Journ. Linn. Soc. vii. p.* 25. *Stephanophysum, Baikiei,* Hook. Bot. Mag. t. 5111.

A native of Brazil but said in the Botanical Magazine (by mistake) to have been introduced from Western Africa. Received in Calcutta in 1860.

2. S. HERBSTII, *T. Anders. Mss. Dipteracanthus? Herbstii,* Hook. fil. Bot. Mag. t. 5156.

A very handsome tender herbaceous plant introduced from Brazil to the Royal Gardens Kew in 1858, and from thence to Calcutta in 1860.

3. STEMONACANTHUS, *Nees.*

S. FORMOSUS. *T. Anders. in Cat. Hort. Bot. Calcutta. Arrhostoxylum formosum,* Nees. in DC. Prodr. xi. p. 215. *Ruellia formosa,* Ait. Bot. Mag. t. 1400.

A native of Brazil; it has been long cultivated in the Botanical Gardens in Calcutta, under the name *Asystasia formosa.*

PETALIDIUM, *Nees.*

P. BARLERIOIDES, *Nees. in Wall. Plant. As. Rar. III. p.* 75 *et* 82.

In the dry tropical forests of the mountainous parts of India from Malabar to the Himalaya between Sikkim and Kumaon. Introduced in 1837.

PHAYLOPSIS, *Willd.*

P. PARVIFLORA, *Willd.* Sp. Pl. III. p. 342.

An inconspicuous plant not uncommon in the forests of Ceylon Southern India, Eastern Bengal and Burmah; also detected in Madagascar and Senegambia. Introduced from Chittagong in 1866.

HEMIAGRAPHIS, *Nees.*

1. H HIRTA, *T. Anders. in Journ. Linn. Soc. IX. p.* 462. *Ruellia hirta,* Vahl. Symb. III. p. 84 t. 67. *R. latebrosa,* Roxb Fl. Ind. III. p. 46.

Common in grassy places in Lower Bengal and occurring sparingly in the Upper Gangetic plain as far north as Umballah. Indigenous in the Botanical Gardens. I have seen a white flowered variety of this species.

2. H. ELEGANS, *Nees. in DC. Prodr. XI. p.* 722.—*Ruellia Pavala,* Roxb. Fl. Ind. III. p. 47.

In dry mountain woods in the North Western Himalaya, Parasnath, Malabar and Concan; also in hilly places in Burmah near Rangoon, Prome and Taong Dong. Introduced from Parasnath in 1868.

3. H. DECAISNIANA, *T. Anders. Ruellia hirsuta,* Nees. in DC. Prodr. XI. p. 150.

An inhabitant of mountain woods in Java and Timor. Received from the Botanical Gardens Buitenzorg in 1865.

4. H. HIRSUTA, *T. Anders. Ruellia hirsuta,* Nees. in DC. Prodr. XI. p. 148.

In the hilly parts of Java and the island of Timor. Received from the Botanical Gardens Buitenzorg with the preceding species.

STROBILANTHES, *Blume.*

SECT. EUSTROBILANTHES.

1. S. SCABER, *Nees. in Wall. Pl. As. Rar. III. p.* 84. —*Ruellia flava,* Roxb. Fl. Ind. III. p. 43.

In dry forests in Eastern Bengal and Burmah and doubtfully reported from Ceylon and Timor. Introduced from Silhet in 1825.

2. S. CRISPUS, *Blume. Bijdr. p.* 798.

A native of Burmah and Java; introduced from the Botanical Garden of Buitenzorg in 1865.

3. S. INVOLUCRATUS, *Blume. Bijdr. p.* 799.

A species from the mountains of Java. It was introduced from the Botanical Gardens of Buitenzorg in 1865 under the name of *S. Heyneanus,* which I consider to be a synomyme of *S. lupulinus.*

SECT. AMENTIANTHES

4. S. AURICULATUS, *Nees. in Wall. Pl. As. Rar. III. p.* 86. *t.* 195.

In the subtropical Forests of the Himalaya from Bhotan to Gharwal; also on Parasnath and the mountains of Central India, the Khasia Hills and Burmah. Formerly cultivated in the Botanical Gardens but lost since many years. Introduced again from Parasnath in 1868.

5. S. SABINIANUS, *Nees. in Wall. Pl. As. Rar. III. p.* 86.

A handsome species found in dense forests in Nipal and the Khasia Hills; introduced in 1824.

6. S. MACULATUS, *Nees. in DC. Prodr. XI. p.* 190. *Ruellia maculata,* Wall. Pl. As Rar. III. p. 33. t. 250.

In shady subtropical woods in the Khasia Hills and Eastern Himalaya. The silvery white spots on the leaves of this species so beautifully marked in its native forests are seldom well developed in Calcutta. I have seen the species only once in flower although the plant is exceedingly common in the Cinchona plantations in Sikkim.

7. S. PECTINATUS, *T. Anders. in Jour. Linn. Soc. XI.p.* 474.

A native of the dense temperate forests of the Khasia Hills and Sikkim from 5 to 7,000 feet above the sea. I have observed 3 shades of colour in the flowers of this species at Darjeeling *viz,* dark blue, purple, and very rarely, pure white. Its specific name is taken from the bracts which are toothed. Nees. erroneously read Wallich's specific name as *echinata*; hence *S. echinatus* is the name given in the Prodromus.

SECT. GOLDFUSSIA.

8. S. GLOMERATUS, *T. Anders. in Journ. Linn. Soc. IX. p.* 475.

Introduced into the Botanical Gardens from the Khasia Hills; it has also been discovered by Dr. Brandis in Burmah on the Taipis mountains near river Saliven.

9. S. CAPITATUS, *T. Anders. in Journ. Linn. Soc. IX. p.* 475.

Common on steep banks in the tropical forests of the Himalaya from Bhotan to Central Nepal. Also in the Karen mountains in Burmah. Introduced from Sikkim in 1863.

10. S. INFLATUS, *T. Anders. in Journ. Linn. Soc. IX. p.* 476.

A native of the dense wet oak forests of Sikkim, at elevations from 5 to 8,000 feet above the sea. This species apparently produces flowers only once after 7 or 8 years and the plants die after flowering. The colour of the corolla is deep blue.

11. S. UROPHYLLUS, *Nees. in D.C. Prodr. XI. p.* 192.

Not uncommon in the temperate forests of Sikkim and the Khasia Hills; introduced from Darjeeling in 1866. The flowers are small and white, and covered with downy hairs.

12. S. PENTSEMONOIDES, *T. Anders. in Journ. Linn. Soc. IX p.* 477.

In temperate forests throughout the Himalayan Chain. Introduced from Darjeeling, in 1866.

13. S. ISOPHYLLUS. *T. Anders. in Cat. Pl. Hort, Bot. Cal. p.* 43.

A native of the forests of Assam, the lower region of the Khasia Hills and Sylhet. Introduced into the Botanical Gardens from Silhet in 1829.

14. S. ANISOPHYLLUS, *T. Anders. in Cat. Pl. Hort Bot. Calcutt. p.* 43. *Ruellia anisophylla.* Hook. Exot. Fl. t. 191.

Introduced into the Botanical Gardens from the Khasia Hills in 1829. It has also been found on the outer ranges of the Bhotan Himalaya at Dewangiri.

SECT. SECUNDIFLORI.

15. S. DIVARICATUS. *T. Anders. in Journ. Linn. Soc. IX. p.* 478.

A large shrubby gregarious species, inhabiting the temperate forests of Nepal, Sikkim and the Khasia Hills. The flowers are large and snowy white, with a dark brown spot on the inside of the tube of the corolla ; the plants flower properly only once in their life time, and die after the ripening of the seed ; introduced from Darjeeling in 1866.

16. S. RUBESCENS, *T. Anders. in Journ. Linn. Soc. IX. p.* 479.

A beautiful species producing a profusion of large blue flowers, apparently only once in its life time. A native of the sub-temperate forests of Sikkim and the Khasia Hills ; introduced from Darjeeling in 1866.

SECT. PANICULATI.

17. S. COLORATUS, *T. Anders. in Cat. Pl. Hort. Bot. Calc. p.* 43, *Goldfussia colorata,* Nees. in Wall. Pl. As. Rar. III. p. 98.

In the valley of Assam, also in the tropical parts of the Khasia Hills ; introduced from Assam in 1852.

In addition to these species, there are 2 unknown species of *Strobilanthus* from Ceylon cultivated in the garden. They have not been determined as they have not flowered here.

ÆCHMANTHERA, *Nees.*

Æ. WALLICHII, *Nees. in DC. Prodr. XI. p.* 170.

Var : *β. Gossypina, Ruellia gossypina,* N. ab E. in Wall. Pl. As. Rar. I. p. 38, t. 42.

From the dry subtropical forests of Nepal, Kumaon and Ghurwal ; also from Assam ; introduced in 1863.

DÆDALACANTHUS, *T. Anders.*

SECT. 1. EUDÆDALACANTHUS. *Segments of the limb of the corolla recurved in the expanded flower.*

1. D. SPLENDENS, *T. Anders. in Journ. Linn. Soc. IX. p.* 486.

A very handsome species, native of the dry forests of the lower ranges of Sikkim ; introduced from Sikkim in 1865. The segments of the corolla change to a dark cinnabar colour on the opening of the flower.

2. D. MACROPHYLLUS, *T. Anders. in Journ. Linn. Soc. IX.* p. 487. *Eranthemum macrophyllum,* Wall. Cat. 7179.

A native of the mountains of Burmah, the Tenasserim Provinces and Andaman Islands ; introduced from Moulmein, in 1866.

SECT. 2. Pseudœranthemum. *Limb of the corolla rotate.*

3. D. NERVOSUS, *T. Anders. in Journ. Linn. Soc. IX. p.* 487.—*Justicia nervosa,* Vahl. En. I p. 164. *Justicia pulchella,* Roxb. Pl. Corom. p. 41. t. 177. *Eranthemum nervosum,* R. Br. Prodr. Fl. Nov. Holl. p. 476. *E. pulchellum,* Andr. Rept. t. 88.

A native of the forests of the outer ranges of the Himalaya from Assam to Simla, occurring in the Terai of Sikkim and Bhotan, cultivated in the Botanical Garden since before 1793.

4. D. SCABER, *T. Anders. in Journ. Linn. Soc. IX. p.* 487. *Eranthemum scabrum,* Wall. Mss. Cat. Hort. Bot. Cal. inedit. I. p. 40.—*E. nervosum var; scabrum,* Nees. in DC. Prodr. XI. p. 446.

A species very nearly allied to the preceding one but differing in the form of the spikes of flowers; the marking of the bracts, the colour of the corolla and the time of flowering. It occurs in the forests of Nepal, Sikkim, Bhotan and the Khasia Hills; also in Burmah; introduced from the Khasia Hills in 1828.

5. D. STRICTUS, *T. Anders. in Journ. Linn. Soc. IX p.* 487. *Eranthemum strictum,* Colebr. in Roxb. Fl. Ind., or Ed. Wall. I. p. 114. Bot. Mag. t. 3068.

In tropical forests in the Khasia Hills, Assam and Chittagong; introduced from the Khasia Hills in 1813.

6. D. SALACCENSIS, *T. Anders.*—*Eranthemum detruncatum,* Teijs. et Binnen. Cat. Plant. Hort. Bot. Bog, p. 152. non. Nees. *E. Salaccense,* Blume Bijdr. p. 792.

In forests on the mountains of the Western part of Java; introduced from the Botanical Gardens Buitenzorg in 1866.

7. D. PURPURASCENS, *T. Anders. in Journ. Linn. Soc. IX. p.* 468. E. *purpurascens,* Nees. in DC. Prodr. XI p. 447.

A native of the mountains of Southern and Central India and Behar; brought from Parasnath in 1858.

BARLERIA, *Linn.*

SECT. I. Armatæ.

1. B. BUXIFOLIA, *Linn. Sp. Pl. p.* 636. Wight. Icon. t. 870.

In dry rocky places in Southern India ; introduced from Mysore in 1801.

2. B. PRIONITIS, *Linn. Sp. Pl. p.* 636. Wight. Icon. t. 452.

A native of all the dry regions of India from Ceylon to the upper gangetic plain, but not extending to the Himalaya nor the Punjab. It is used in India and the Philippine Islands as a hedge plant, but I have seen no indigenous specimens from these countries. A pale yellow variety exists in the Botanical Gardens. This species has been in cultivation in Calcutta previous to 1793.

3. B. LUPULINA, *Lindl. Bot. Reg. t.* 1483.

A beautiful species with very dark green leaves with a red colored midrib, a native of the drier parts of Madagascar ; introduced from the Botanical Garden Mauritius in 1863.

SECT. II. Inermes. †. *Bracts with ciliated or dentate margins.*

4. B. CRISTATA, *Linn. Sp. Pl. p.* 636, Bot. Mag. t. 1615. Roxb. Fl. Ind. III, p. 37.

A native of the drier portions of the Himalaya from Sikkim to Kashmir, also from Behar, Eastern Bengal, Burmah, and the Malayan Peninsula, but probably not truly indigenous in countries to the south of Burmah, flowers dark blue ; introduced before 1793.

5. B. CILIATA, *Roxb. Fl. Ind. III. p.* 38.

Found in dry banks in the northern parts of Bengal. It is probably a pink flowered variety of B. cristata ; cultivated in the Botanical Garden since 1799.

6. B. DICHOTOMA, *Roxb. Fl. Ind. III. p.* 39.

The native place of this species is doubtful. Dr. Roxburgh first met with it growing in a garden near Calcutta The plants in the Botanical Gardens sometimes produce small abortive flowers. These 3 species—B. cristata, B. ciliata and B. dichotoma,—are very closely allied, if they are not mere varieties of one species.

7. B. POLYTRICHA, *Wall. Pl. As. Rar. I. p.* 72. *t.* 82. *B. hirsuta,* Nees. in Wall. l. c. III. p. 91.

A native of the Forests of Burmah and the Tenasserim provinces ; introduced before 1843.

8. B. CŒRULEA, *Roxb. Fl. Ind. III. p.* 39.

Growing in shady places in the Forests of the Himalaya from

Assam to Nepal; also on Parasnath, Orissa, Malabar and Burmah; introduced before 1793.

††. Bracts with the margins entire.

9. B. INVOLUCRATA, *Nees. in Wall. Pl. As. Rar. III. p.* 92. *B. pentandra*, Arnt. fide. Nees. in DC. Prodr. XI. p. 232.

A native of the mountains of Southern India and Ceylon; introduced from Ceylon in 1863.

10. B. ARNOTTIANA, *Nees. in DC. Prodr. XI. p.* 232.

Mountain woods in Ceylon; introduced in 1863.

11. B. MONTANA, *Nees. in Wall. Pl. As. Rar. III. p.* 92.

In the mountains of Concan, also extending into Central India as far North as Jubbulpore; received from the Garden of the Agri-Horticultural Society of Madras in 1862.

12. B. GIBSONI, *Dalz. in Hook. Journ. of Bot. II. p.* 339. *Bot. Mag. t.*

Found by Dr. Gibson, Conservator of Forests Bombay, in the mountains of the Concan; introduced in 1843.

NEURACANTHUS, *Nees.*

N. PARVIFLORUS, *T. Anders. Mss.*

An erect somewhat rigid looking plant, with very minute flowers in densely imbricated 4 cornered spikes; received from the Botanical Gardens Mauritius in 1864.

LANKESTERIA, *Lindl.*

L. ELEGANS, *T. Anders. in Journ. Linn. Soc. VII. p.* Pal. de Beaur. Fl. Owar. t. 50.

A native of Tropical Western Africa; introduced from the Royal Gardens Kew in 1867.

CROSSANDRA, *Salisb.*

C. INFUNDIBULIFORMIS, *Nees. in Wall. Pl. As. Rar. III. p.* 98.

A native of the dry regions of India and extending from Ceylon to the Himalaya; but occurring most abundantly in Central and Southern India. The prevalent colour of the corolla is orange yellow, but a pale yellow variety is cultivated in the Botanical Gardens.

LEPIDAGATHIS, *Willd.*

1. L. PURPURICAULIS, *Nees. in Wall. Pl. As. Rar. III. p.* 96.—*Ruellia retrofracta*, Wall. Cat. 7165.

This is rather a local species. It has been found only in the dry parts of the Western Himalaya, on dry rocks in Parasnath and in the mountains of Burmah; introduced from Parasnath in 1868.

2. L. LINEARIS, *T. Anders. in Cat. Hort. Bot. Cal. p.* 43. *et Journ. Linn. Soc. IX. p.* 496.

A native of Burmah from whence it was introduced in 1854 by Mr. R. Scott, Head Gardener of the Botanical Garden.

3. L. HYALINA, *Nees. in Wall. Pl. As. Rar. III. p.* 95.

Inhabiting mountain woods in the Himalaya, Assam, Central and Southern India, and Burmah and China. The habits of the plants are much influenced by exposure to sun light; in shady woods the upright lax form is the usual state met with; but in open exposed places the plant becomes more or less prostrate (vars; γ et δ of my enumeration of East Indian Acanthaceæ in the Linnæan Society's Journal.)

ACANTHUS, *Linn.*

1. A. MOLLIS, *L. Sp. Pl. ed. Willd. III. p.* 397.

A native of the Northern and Southern shores of the Mediterranean; introduced from the Jardin des Plantes in 1868. This species flowers freely in Darjeeling, but it is not known to have flowered in Calcutta.

2. A. MONTANUS, *T. Anders. in Journ. Linn. Soc. VII. p.* 87.

Found in mountainous places in tropical Western Africa from Fernando Po to some degrees South of the Equator; introduced from the Royal Gardens Kew in 1868.

3. A. ILICIFOLIUS, *L. Sp. Pl. p.* 639.

An inhabitant of sea shores, in all parts of tropical Asia and parts of Africa, extending far inland along the fresh water creeks of the mouths of all the large rivers; growing luxuriantly in the Botanical Gardens in fresh water.

APHELANDRA, *R. Br.*

1. A. VARIEGATA, *Morel. in Fl. des Ser. X. t.* 981.

A native of Brazil introduced from the Royal Gardens Kew in 1868.

2. A. TETRAGONA, *Nees. in DC. Prodr. XI. p.* 295.

Found in Trinidad and on the continent of America from Venezuela to Guiana and Ecuadro; introduced from the Royal gardens Kew in 1859.

3. A. FULGENS, *Hort.*

Introduced into Europe from tropical America; received in India in 1850.

4. A. PECTINATA, *Willd. in herb. n.* 11623. Nees in DC. Prodr. XI. p. 297.

A native of tropical America from Mexico to Guiana and Ecuador, also of St. Vincent; introduced in 1846.

GEISSOMERIA. *Lindl.*

1. G. AURANTIACA, *Lindl.*

Native of Brazil; received from the Royal gardens Kew in 1856.

ANDROGRAPHIS

1. A. PANICULATA, *Nees. in Wall. Pl. As. Rar. III. p.* 116. *Justicia paniculata,* Burm. Fl. Ind. p. 9. Roxb. Fl. Ind. I. p. 117.

A common plant in India, Ceylon and Java under the shade of trees in open places, but avoiding the dense forests of the moister regions. Naturalized in the West India islands.

The dried plant has bitter tonic properties and is the basis of the compound called Drogueamore.

2. A. ECHIOIDES, *Nees. in Wall. Pl. As. Rar. III. p.* 117. *Justicia echioides,* Linn. Fl. Zeyl. p. 8. n. 21. Roxb. Fl. Ind. I. p. 118.

The geographical distribution of this species is nearly the same as that of the preceding species.

GYMNOSTACHYUM, *Nees.*

1. G. ANDROGRAPHIOIDES, *T. Anders. in Journ. Linn. Soc. IX. p.* 504.

A native of Asam, Chittagong and Burmah, apparently not very common but probably over-looked from its small flowers, and slightly scandent habit; introduced from Chittagong by Mr. John Scott in 1866.

2. G. HIRSUTUM, *T. Anders. in Thwaites En. Pl. Zeyl. p.* 233.

Introduced from the Botanic Gardens Peradenia, Ceylon, in 1867. It occurs in the mountains of the central provinces of the island.

3. G. CEYLANICUM, *Nees. in DC. Prodr. XI p.* 93. Bot. Mag. t. 4706.

A lovely little plant with variegated leaves, a native of the shady forests of Ceylon; introduced from the Botanical Gardens Peradenia in 1867.

PHLOGACANTHUS, *Nees.*

†. *Flowers in spikes at the end of the branches.*

1. P. THYRSIFLORUS, *Nees. in Wall. Pl. As. Rar. III. p.* 99. —*Justicia thyrsiflora,* Roxb. Fl. Ind. I p.114

Common in forests in the Himalaya from Bootan to Gharwal, Khasia Hills and Assam, but only at low elevations; introduced by Dr. Carey, in 1800.

Var. *a, floribus flavidis.* Introduced from Sikkim in 1867.

2. P. VITELLINUS, *T. Anders. in Journ. Linn. Soc. IX.* p. 507.—*Justicia vitellina,* Roxb. Fl. Ind. *I.* p. 115. *J. asperula,* Wall Cat. 7171. *J. quadrangularis,* Wall. Cat. 2451 Bot. Mag. t. 2845.

A native of the Eastern Himalaya, the Khasia Hills, Assam and Chittagong; introduced from Chittagong in 1811.

3. P. PULCHERRIMUS, *T. Anders. Journ. of Linn. Soc. IX. p.* 507.

From the dry forests of the Tenasserim provinces; introduced from Moulmein in 1866.

††. *Flowers in short axillary cymes or verticells.*

4. P. PUBINERVIUS, *T. Anders. in Journ. Linn. Soc. IX. p.* 508.

A rare plant from the dense forests of the Khasia Hills and Sikkim, growing at elevations between 1500 and 4000 feet above the sea; introduced from Sikkim, in 1867.

CYRTANTHERA, *Nees.*

1. C. POHLIANA, *Nees. in Endl. et Mart. fl. Bras. fasc.* 7. *p.* 101. *Justicia carnea,* Lindl. et. hort.

A native of Brazil; introduced in 1861.

2. C. sp. ignota.

Introduced from the Botanical Gardens Buitenzorg in 1861, under the name of *Rhytiglossa secunda var, intermedia.*

DIANTHERA, *Gronov.*

1. D. ANDROSAEMIFOLIA, *Griseb. Fl. West Ind. islands. p.* 455.—*Rhytiglossa androsaemifolia,* Nees. in DC. Prodr. XI. *p.* 352.

A native of the islands of St. Dominica and Martinique, introduced from the Royal Gardens Kew, in 1861.

BELOPERONE, *Nees.* *

1. B. VIOLACEA, *Planch et Linden, Hort Lind. n.* 5. *Justicia Lindeni.* T Anders. in Cat. Hort. B. Cal. p. 44.

New Granada; introduced from the Royal Gardens Kew in 1862.

2. B. PLUMBAGINIFOLIA, *Nees. in Endl. et Mart. Fl. Bras. fasc.* 7. p. 139.—*B. oblongata,* Nees. in Wall. Pl. Asiat. Rar. III. p. 102. Bot. Reg. t. 1657.

A native of Brazil; introduced in 1863.

JUSTICIA, *Linn.*

SECT. 1. Betonica. *Spikes usually terminal, rarely axillary, furnished with large imbricated bracts.*

1. J. ADHATODA, *L. Fl. Zeyl. p.* 16. *Adhatoda Vasica,* Nees. in Wall. Pl. As. Rar. III. p. 103. *J. Adhatoda,* Roxb. Fl. Ind. I. p. 126. Bot. Mag. t. 861.

A common plant in dry rocky places, especially on the steep sides of water courses in India, from Ceylon to the foot of the North-west Himalaya, also in China and Java; cultivated in the Botanical Garden before 1793.

2. J. VENTRICOSA, *Wall. Pl. As. Rar. I. p.* 80. t. 93. *Adhatoda ventricosa,* Nees. in DC. Prodr. XI. p. 407.

Introduced from China in 1820, but also a native of the Tenasserim Provinces of Burmah.

3. J. ATKINSONII, *T. Anders. in Journ. Linn. Soc. Vol. IX. p.* 509.

A not uncommon plant in the moistest valleys of Sikkim up to an elevation of 2500 feet above the sea; introduced in 1866.

4. J. GRANDIFOLIA, *T. Anders. in Journ Linn. Soc.* IX. p. 510.

A handsome foliaged species with delicate flowers, introduced in 1866, from the garden of the Rev. C. Parish of Moulmein—it was discovered in the Tenasserim forests.

5. J. BETONICA, *Linn. Fl. Zeyl. p.* 6. Roxb. Fl. Ind. I. p. 128. *Adhatoda Betonica,* Nees. in Wall. Pl. As. Rar. III. p. 103.

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* The genus Beloperone rests on very indefinite characters. It will probably require to be reduced to Justicia.

In dry open places especially in the mountainous districts of Ceylon, Carnatic, Concan and Malabar and throughout Central India as far as the mountain Parasnath ; extending to Abyssinia and southern Africa introduced in 1803.

6. J. RAMOSISSIMA, *Roxb. Fl. Ind. I. p.* 129. *Adhatoda ramosissima*, Nees. in Wall. Pl. As. Rar. III. p. 103.

A native of Coromandel, introduced before 1813.

SECT. 2. ROSTELLARIA. *Flowers in terminal spikes, rarely axillary and solitary; bracts often with ciliated margins. Calyx* 4 *partite, superior division more or less divided.*

7. J. PROCUMBENS, *Linn. Fl. Zeyl. p.* 7. Roxb. Fl. Ind. I. p. 132. *Rostellaria procumbens*,. Nees. in Wall. Pl. As. Rar. III. p. 101.

A very common weed in tropical Asia, found all over India and extending throughout the Malayan Archipelago to the Philippine islands and North China. It occurs also in Abyssinia ; indigenous in the Botanical Garden.

8. J. ORBICULATA, *Wall. Cat.* 2489. *Rostellaria rotundifolia*, Nees. in Wall. Pl. As, Rar. III. p. 512.

Not so common as the preceding species and more restricted in its distribution, it extends in India from the Carnatic to the upper Gangetic plain : also recorded from Java, whence the plant in the Botanical Garden was introduced in 1863.

9. J. FURCATA, *Jacq. Hort. Schoenbr. I. p.* 2. *t.* 3. *J. Peruviana*, Cavan. Icon. I. p. 17. Roxb. Hort. Bengh. p. 4.

A native of Mexico ; introduced from Philadelphia, United States, in 1805.

SECT. 3. GENDARUSSA. *Flowers collected into axillary pedunculated spikes, or sessile and solitary: half shrubby plants with small bracts and usually inconspicuous flowers.*

10. J. GENDARUSSA, *Linn. Suppl. p.* 85. Roxb. Fl. Ind. I. p. 128. *Gendarussa vulgaris*, Nees. in Wall. Pl. As. Rar. III. p. 104.

Probably of Chinese origin but now apparently wild in many of the drier parts of India, the islands of the Malayan Archipelago, the Philippine and China. Roxburgh says (l. c.) he never met with it wild ; introduced before 1793.

11. J. NEESIANA, *Wall. Cat.* 7175—*Gendarussa Neesiana,* Nees. in Wall. Pl. As Rar. I. p. 105.—*Adhatoda Neesiana,* Nees. in DC. Prodr. XI. p. 397.

Found in the Khasia hills by the Botanical Garden collector De Silva and sent by him to the Gardens in 1829.

SECT. 4. RHAPHIDOSPORA. *Flowers usually disposed in loose panicles, more rarely verticillately arranged on spikes, corolla tube somewhat lengthened.*

12. J. DECUSSATA, *Roxb. Fl. Ind. I p.* 127—*Gendarussa decussata,* Nees. in Wall. Pl. As. Rar. III. p. 104.

A species extending throughout Burmah, the Tenasserim Provinces and Sumatra; introduced from Burmah in 1810.

13. J. SP. IGNOT.

Introduced from the Botanical Garden Bourbon in 1865, under the name *Rhytiglossa paniculata.*

RUNGIA, *Nees.*

R. PECTINATA, *Nees. in DC. Prodr. XI. p.* 470. *Justicia pectinata,* Linn. in Amœn. Acad IV. p. 299. Roxb. Fl. Ind. I. p. 133.

A common weed throughout India, Ceylon and Burmah, also from the Andaman islands: indigenous in the Garden.

DICLIPTERA, *Juss.*

1. D. ROXBURGHII, *Nees. Wall. Pl. As. Rar. p. III. Justicia latebrosa,* Roxb. Fl. Ind. I. p. 125.

A common straggling weedy plant under shade of trees, especially in hilly places throughout North India, the Himalayas and Afghanistan, but apparently not extending further south than the Northern Circars.

2. D. CHINENSIS, *Juss. Justicia Chinensis,* Vahl. Symb. II. p. 13, Roxb. Fl. Ind. I. p. 124.

A native of China from whence it was sent in 1809 by Mr. Kerr. It occurs abundantly under the shade of trees in the Botanical Gardens, but I have not met with it in other parts of Bengal.

3. D. BURMANNII *Nees. in Wall. Pl. As. Rar. III. p.* 112. *Justicia Chinensis,* Burm. Fl. Ind. p. 8, t 46 f. I. non Vahl.

A weed in waste places near Batavia; introduced from the Botanical Gardens Buitenzorg in 1862.

PERISTROPHE, *Nees.*

1. P. BICALYCULATA, *Nees. in Wall. Pl. As. Rar. III. p.* 113. *Justicia bicalyculata,* Vahl. Symb. II. p. 13. Roxb. Fl. *Ind.* I. p. 126.

A native of waste places by road sides and about villages in tropical Asia and Africa, from Burmah to the Cape de Verde islands, but not observed in Ceylon.

2. P. SPECIOSA, *Nees. in Wall. Pl. As. Rar.* III. *p.* 113— *Justicia speciosa,* Roxb. Fl. Ind. I. p. 122.

This beautiful plant inhabits the dense tropical forests of Nepal, Sikkim, Bhotan and the Khasia Hills. It was sent to the Botanic Garden by Dr. Carey in 1803 from Sylhet.

3. P. TINCTORIA, *Nees. in Wall. Pl. As. Rar.* III. *p.* 113. *Justicia tinctoria,* Roxb. Fl. Ind. 1. p. 123.

A native of Bengal, Assam and the Khasia Hills. It occurs near Calcutta but the plants in the Botanical Garden are stated in the catalogue of the Garden to have been introduced from Amboyna in 1795.

HYPŒSTES.

1. H. PURPUREA, *R. Br. Prodr. Fl. Nor. Holl. p.* 474.

Introduced from China in 1820.

2. H. LAXIFLORA, *Nees. in DC. Prodr. XI. p.* 508.

A native of Java and the Philippine islands, it is also reported from Tropical Australia; introduced from the Botanical Gardens Buitenzorg in 1862.

3. H. POPULIFOLIA, *Miq. Fl. Ind. Bat. Vol. II. p.* 852.

Found in the Mountains of Java, and introduced from the Botanical Gardens Buitenzorg in 1865.

4. H. DECAISNEANA, *Nees. in DC. Prodr. XI. p.* 508.

A native of Java and Timor, introduced from the Botanical Gardens Buitenzorg in 1865.

5. H. LONGIFOLIA,

This species was received under this name from the Botanical Gardens Buitenzorg in 1865. I have not been able to refer the plant to any described species.

RHINACANTHUS.

R. COMMUNIS, *Nees. in Wall. Pl. As. Rar. III. p.* 109. *Justicia Nasuta. Linn.* Roxb. Fl. Ind. t. p. 120.

This plant is common in gardens, it is found wild in the dry hilly districts of India from Behar to Ceylon, also in Burmah. It seems to extend to Java and Madagascar. Roxburgh l. c. says "it never ripens its seed" but I have noticed seeds on specimens from Southern India; cultivated in the Garden before 1795.

THYRSACANTHUS, *Nees,*

1. T. SESSILIS, *Nees. in DC. Prodr. XI. p.* 324.

A native of Columbia, and received here from the Botanical Gardens Buitenzorg in 1865

2. T. STRICTUS, *Nees. l. c.*

A native of Honduras cultivated in England since 1840; received from the Botanical Gardens Buitenzorg in 1862.

3. T. COCCINEUS, *T. Anders. Mss. Pachystachys coccinea,* Nees. in DC. Prodr. XI. p. 319. *Justicia coccinea,* Aubl. Bot. Mag. t. 432.

A native of South America and the West Indian islands, received from England in 1843.

4. T. SQUARROSUS, *T. Anders. Mss.*

A native of tropical America, received from the Royal Gardens Kew in 1860 under thename of *Sericographis squarrosa*, but I hesitate to adopt this as correct, as Nees, description of S. squarrosa DC. Prodr. XI. p. 364 does not agree with the plant cultivated here as regards the colour of the corolla.

5. T. CALYCOTRICHUS, *T. Anders. Mss. Schaueria calycotricha,* Nees. in DC. Prodr. XI. p. 316, *Justicia calycotricha,* Hook. Exot Fl. t. 212.

A native of Brazil, and cultivated in this Garden previous to 1843.

GRAPTOPHYLLUM, *Nees.*

1. G. HORTENSE, *Nees. in Wall. Pl. As. Rar. III p.* 285.

Var: *α, T. Anders.*—leaves green and strongly variegated with white lines and blotches.

Var: *β, T. Anders.*—leaves of a uniform dark copper colour.

Var: *γ, T. Anders.*—leaves copper coloured, variegated with white lines and blotches. The white colour has sometimes a tinge of rose in it.

These three varieties are common throughout all India within the tropics. The green unvariegated state, the normal condition of the species, is not so common. The dry extreme climate of North Western India and the Punjab is not favourable to the cultivation of this plant.

The species is apparently indigenous to some of the islands of the Pacific. These plants have been cultivated here since before 1793: the date of their introduction into India is unknown.

ERANTHEMUM, *Linn.*

1. E. ECBOLIUM, *T. Anders. in Thwaites's En. Pl. Zeyl. p.* 235. *Justicia Ecbolium,* L.; Roxb. Fl. Ind. I. p. 114; Bot. Mag. tab. 1847.

Var: *viridis, T. Anders.*—Bracts and stems uniform green, corolla straw coloured.

This species is an inhabitant of mountain woods in Southern India, Ceylon, Assam, Burmah and the Malayan peninsula; extending also to Arabia, Abyssinia and Madagascar. It is doubtful I think if the species is truly wild in Assam and the Malayan peninsula. It has been cultivated in the Botanical Gardens since before 1793, and the common state of the species with lurid bracts and bluish green flowers, as also the variety with straw coloured flowers, are common in waste places near the villages surrounding the Garden.

2. E. COOPERI, *Hook. Bot. Mag. t.* 5467.

Introduced into England from New Caledonia, and received here from the Royal Gardens Kew in 1866.

3. E. BICOLOR, *Schrank. Hort. Monac. t.* 8—*Justicia bicolor,* Bot. Mag. *t.* 1463.

A native of Java, Timor and the Phillippine islands; received from the Botanical Gardens Buitenzorg in 1862. Roxburghs *E. diantherm* Fl. Ind. I. p. 112 which Nees. quotes as a synonym of this species is quite distinct. Roxburghs coloured drawing of E. diantherm represents a plant I have never seen and which I cannot refer to any species of this genus.

4. E. BLUMEI, *Teysm. Mss. in Miq. Fl. Ind. Bot. II. p.* 836.

I discovered this species growing in dense forests near Singapore, it was originally discovered by Teysman in Sumatra: received from the Botanical Gardens Buitenzorg in 1862.

5. E. TEIJSMANNII, *T. Anders. Mss.*

A fine species with a straggling habit. It was received from the

Buitenzorg Botanical Garden before 1861 but without any specific name.

6. E. CRENULATUM, *Wall. in Bot. Reg. t.* 879.

A rather extensively distributed plant delighting in the densest shade of tropical forests. It occurs in Sikkim, the forests of the Western ghats, Ceylon, the Tenasserim provinces, and Java. The varieties indicated by Nees, in the Prodromus are not very constant. The state of the species which Teysman in the catalogue of the Botanical Gardens of Buitenzorg has called *var. grandiflorum* seems to be well marked. This species is rather difficult to keep in cultivation and accordingly though frequently introduced has generally disappeared after a few years: the *var. grandiflorum* was received from Buitenzorg in 1862 and the tropical state of the species was introduced from Sikkim in 1868.

7. E. ZOLLINGERIANUM, *Nees. in DC. Prodr. XI. p.* 455.

A native of the Phillippine islands; received from the Botanical Gardens Buitenzorg in 1862. Miquel. Fl. Ind Bot. II. p. 836 under *E. crenulata* doubtfully refers this species to *E crenulata, Wall.*

8. E. ERECTUM, *Hort.*

I have not been able to ascertain the native country of this Eranthemum. It was received from the Botanical Gardens of Buitenzorg in 1862.

9. E. LAPATHIFOLIUM, *Nees. in DC. Prodr. XI. p.* 454.

The plant received in 1865 under this name from the Botanical Gardens Buitenzorg can only be very doubtfully referred to *E. lapathifolium*.

10. E. VISCIDUM, *Blume. Bijdr. p.* 793. ? ?

I doubt the correctness of this identification. Blume's plant is said (Nees. Prodr. XI. p. 447.) to be nearly allied to Eranthemum (Dædalacanthus mihi) nervosum but the plant received from Buitenzorg in 1865 under the name of E viscidum is a true Eranthemum. E. viscidum, Blume is found in the mountains of Java.

11. E. CINNABARINUM, *Wall. Pl. As. Rar. I. p.* 108. *tab.* 121.

Introduced in 1866 from the Forests of the the Tenasserim provinces. The large conspicuous flowers are quite sterile, seeds are produced only by small deformed flowers in which the limb of the corolla is almost wanting. These flowers are not comonly produced and accordingly seeds are seldom obtained from this species.

ANTHACANTHUS, *Nees.*

A. ACICULARIS, *Nees. in DC. Prodr. XI. p.* 460.

I with great doubt give this name to a small spiny species of Anthacanthus with dark purple flowers which has long been cultivated here as a species of Barleria. It is a low spreading prickly shrub with firm, acicular pointed leaves, and all the corollas which I have examined have 4 fertile stamens. It is a native of the West Indian Islands, and thrives here on well drained rubbish heaps.

ASYSTASIA.

1. A. GANGETICA, *T. Anders. in Thwaites En. Pl. Zeyl, p.* 235. *A. Coromendeliana,* Nees. in Wall. Pl. As. Rar. III. p. 89. *Ruellia secunda.* Roxb. Fl. Ind. III. p. 42, *Justicia gangetica,* L. Amoen. 4 p. 290.

var: β flora—albo.

A common weed in all parts of India, south of the Ganges from Lower Bengal to Ceylon, but principally in the drier regions extending along through the Malayan Peninsula to Java. It has likewise been met with in Madagascar, Southern Africa and Abyssinia. The white flowered variety is indigenous in the Botanical Garden.

2. A. AFRICANA, *Hort. Bogor.*

I know nothing of the name and native country of this species, it is quite distinct from all the species of Asystasia which I have seen and I cannot refer it to any described species. The plant was received from the Botanical Gardens Buitenzorg in 1865. The flowers are almost pure white, and are produced nearly throughout the year.

3. A. CHELONOIDES, *Nees. in Wall. Pl. As. Rar. III. p.* 89. *Ruellia chelonoides,* Wall. Cat. 2335.

A very distinct species, a native of the Western Ghats and Ceylon; received from the Botanical Gardens Peradenia Ceylon in 1864.

4. A. NEMORUM, *Nees. in Wall. Pl. As. Rar. III. p.* 90.

This plant was received from the Botanical Gardens Peradenia Ceylon in 1865. It is a native of mountain tropical forests, on the Anamally hills in Southern India, Ceylon and Java, but plants I received from the Botanical Gardens Buitenzorg as this, are distinct from the Indian species.

5. A. SCANDENS, *Hook. Bot. Mag. t.* 4449 *excls. syn. Henfreya scandens,* Lindl. Bot. Reg. 1847. 23. *t.*

A subscandent herbaceous species native of Western Tropical Africa; and received from the Royal Gardens Kew in 1851.

6. A BLUMEI, *Nees. in DC. Prodr. XI. p.* 167.

A local species found only on the table land of Wester Java; received from the Botanical Gardens Buitenzorg Java, in 1865.

7. A. THYRSACANTHUS, *T. Anders. in Jour. Proceed. Linn. Soc.* IX. p. 525 *Thyrsacanthus Indicus,* Nees. in DC. Prodr. IX. p. 325.

A strictly forest species found only along the lower ranges of the Sikkim, and Botan Himalayas and the Khasia Hills; introduced from Sikkim in 1868.

8. A. *sp. dub.*

Received from the Botanical Gardens Buitenzorg in 1865 under the name of *A. nemorum* from the Indian state of which it is quite distinct.

MACKAYA, *Harv.*

M. BELLA, *Harv. Thesaur. Cap. I. p. 8. tab.* 13.

A beautiful and distinct plant found in the dry beds of rivers in the Natal district of southern Africa; received from the Botanical Gardens of Cape Town in 1864.

The few pages devoted above to the correct identification of the Acanthaceous plants now cultivated in the Gardens here, will it is hoped, prove especially useful to Indian Horticulturists—whose gardens are so largely dependent on plants of this order for their ornamentation. In the Botanical gardens of Calcutta, this highly tropical order is very fully illustrated, and the plants carefully named in accordance with the most recent views of the relations of the various genera and species.* References are given to a figure of those species that have illustrations, and which I have been able to refer to. The geographical area of each species is also fully noted, and the date of their introduction to the Botanical gardens is noted in most cases: this may generally be accepted as the date of introduction of the species into Indian gardens. The number of species cultivated here (including a few weedy looking indigenes of this garden) exceeds 150: the largest proportion of which are Indian and Javan species, the African and American species being difficult to procure are comparatively rare.

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* See papers by me in the Journal of the Proceedings of the Linnæan Society London on the identification of the species of Acanthaceæ of Linneæus Herbarium vol. VII, page III, and enumeration of the species of Acanthaceæ from the Continent of Africa in vol. VII, page, 13, as also vol. IX page 425, for an enumeration of Indian Acanthaceæ.

Until recently all the Acanthaceæ have been cultivated in the open ground, generally in the flower borders of the garden where the soil is kept open. Under this treatment many of the species grow vigorously and afford in their season of bloom some of the gayest ornaments of the Indian flower garden: but there are many other lovely species, and especially those which inhabit the cool mountain forests of the Himalaya, the Khassia Hills, Ceylon and Java with some delicate American species which have been kept alive with difficulty. The dry atmosphere and scorching sun prevailing during March, April, and May are most pernicious to these plants, and excepting perhaps moisture, stagnant about their roots, are the worst conditions in which they could be placed. Shade-loving species of Acanthaceæ have however lately been removed to a cool house like those adopted here for the cultivation of orchids and ferns. In such structures these delicate Acanthaceæ have grown with a surprising vigour, and have become a mass of beautiful luxuriant foliage, and many of them have already blossomed as freely as in their native forests.

Some of the Ruellia and the allied genera Stephanophysum and Stemonacanthus, nearly all the Strobilanthi, some of the Dædalacanthi, all the Aphelandræ, Cyrtanthera, Beloperone, the American Justiciæ, several of the Eranthemæ, and five species of Thyrsacanthus thrive under shelter, while exposed in open borders some of them barely exist, and scarcely ever flower.

Many of the Acanthaceæ produce good seed in Calcutta, and all are readily propagated by cuttings.

Report on the germination of the Vegetable and Flower seeds imported by this Society in 1868, *and on a few of the latter collected in the Royal Botanical Gardens of Calcutta and Rungyroong, Darjeeling. By* JOHN SCOTT ESQ., *Curator Royal Botanical Garden.*

IN tabulating the results of the trial sowings of Vegetable and Flower seeds imported by the Society during the past season, I was so much struck with their unsatisfactory nature, that I deemed it necessary to examine the condition of the surplus seeds I had then on hand : indeed, to submit my report without some such enquiry would be an injustice to the seedsmen of the Society ; as clearly they may have been largely affected by deterioration since their despatch and not—as might be thought—wholly due to the inferior quality of the seeds when first imported. I have accordingly examined the seeds of several of the Brassicas, and other Crucifers, as also Peas, Beans and Carrots, and found very clear indications of arrested germination in the largely developed radicles with mouldy apices, shrunk and more or less discolored cotyledons ; while in the same samples, I frequently found other plump and apparently good seeds. These appearances are of course easy of explanation and far from insuggestive. In those with the mouldy and discolored cotyledons, and arrested radicles we may have seeds matured—yet not sufficiently so to resist exposure to the more or less saturated atmosphere, and high temperature of a Bengal rainy season. This seems clear from the fact that the other seeds—and apparently good which may be regarded as the fully matured—resisted without any apparent deterioration the same degree of exposure. Now, though I by no means believe that the very best matured seeds of temperate climes would in general withstand the injurious effects of our rainy season, I do think that much might be gained by the seedsmen having a regard to this in their selection of seeds for tropical export. Even with every care on their part, however, much will always depend on the management after their arrival in the tropics, which is, I believe, generally, during the rains; a season when if in open cases they should be at once taken out, well dried and soldered up in tin, or if in small quantities, they may be well kept in tightly corked bottles.

The results of my own experiments are shown in the subjoined tables. In *Table 1.*, for the sake of comparison, the three assortments of vegetable seeds from the different firms in England, America, and France, are arranged in adjoining columns, and with few exceptions give the results of *two sowings* for each sort. The first sowing was made on the 2nd November and the seeds began to germinate on the 7th and continued germinating more or less until the 3rd December; in the second sowing on the 23rd November, germination commenced on the 2nd December and ceased on the 22nd. The number of seeds sown of each sort varied from five to fifty according to their size: thus in the case of Cucumber and Squash where the seeds are large and only few in a packet, I took a sample of five, of Peas twenty, and of the Brassicas, Carrots &c., I took samples of fifty. As there were no note-worthy differences in the two sowings I did not think it worth while giving them in separate columns. In *Table* 2., the general results are arranged according to the degree of germination.

Tab. 3. comprises the collection of flower seeds from Vilmorin, Andrieux and Co., and selections from the species cultivated in the Botanic Gardens here, and those of Rungyroong, Darjeeling; these latter I have included with a view to show, how many of the species of which seeds are annually imported by the Society are already successfully grown—indeed in several cases naturalized—in Calcutta Gardens, and distributed from the seed department of this Garden. The relative germinative quality of the imported and country seed is shown in my tables, and in general

I have seen no falling off in the flowering properties of the latter. I say in general, for I am aware that the double flowered varieties of certain species have a tendency to become less double in the first progeny from country seed: Balsams and Zinnias may be mentioned as examples; European seeds of the former and those from the North West Provinces of the latter being preferred for growth in the Calcutta Gardens. This reverting tendency is however simply a result of cultivation in conditions different from those in which the *variety* originated, and by no means inveterate; but easily eliminated by careful selection as may be seen by those cultivated in the Botanic Garden here.

I have now briefly to notice a few of the results given in the table of Botanical Garden seed, which appear to me of interest in their relation to acclimatization. On consulting this table it will be observed that while nearly all the species have germinated well, there are a few which have not done so. Thus in the cases of Argemone sulphurea and Zinnia elegans (both of which in general germinate freely from imported seeds) the germination is as low as *one* and *four per cent.* This, suprising as it may appear at first sight, is but a result of acclimatization. The seeds of Argemone and Zinnia of which I have noted the results were matured in our rainy season and of course require a higher temperature to excite their dormant vitality than that afforded by the cold season: on the other hand seeds from Europe matured in a temperature scarcely different from the cold season here, germinate readily. As bearing on the same point, it is further interesting to note that the European seedlings are also much more vigorous than those from the country seed: the latter being then *dwarfed* and *single*, though the *same seed*, kept till the proper sowing season in July will then give a *vigorous double flowered progeny*. Portulacca grandiflora and Mesembryanthemum tricolor are two other favourite annuals which while germinating freely in the cold season from

European seed, do so but tardily from that saved in our gardens, though unlike the Zinnias, when they have germinated they are equally as vigorous and free flowering as the others.

An early flowering batch of Portulacca and Mesembryanthemum can easily be secured from country seed, however, by growing a few plants in gumlahs, and allowing all their seed to drop on the soil then placing the pots in a dry airy godown until the end of the following rainy season, when they may be brought out, carefully watered, and an abundant, and early progeny will in general be the result.

Finally with reference to Vilmorin's flower seeds which have germinated so indifferently with me, I am inclined to think from Mr. Cope's communication, (to the last monthly meeting of this Society,) that these also have suffered since their importation; *i. e*, assuming that Mr. Cope's seeds were despatched shortly after their arrival here, to the dry climate of Amritsur—Punjab—and thus escaped the hurtful influence of our Bengal rains. It must be remembered however that in all cases, in which the number of seeds sown has not been ascertained, much of the success, may be rather apparent than real; due in fact to the minuteness of many of the seeds, and the large number sown in a small space. To illustrate: in a single grain of seeds of Lobelia erinus, there are near 2,000, and the ordinary packet (such as that distributed by this Society) contains the large number of 12,000 seeds. The seeds of Portulaccas are about 600 to the grain, and 3,600 per packet; Mesembryanthemum tricolor 560 per grain, and over 5,000 per packet; even the comparatively large sized seeds of Nemophila, at 37 to the grain, contains in an ordinary packet 4,000. It is evident then that in sowing (as is very generally done,) all the seeds of such packets in a flower-pot, eight to twelve inches in diameter, the germination might appear good, while the seeds were really very indifferent. Thus; even at the low rate of 10 per cent, the larger sized seeds of Nemophila would yield 400 plants, so that the germination would indeed appear good to an observer ignorant of the actual number of seeds sown. This also explains, how in certain cases where my samples have completely failed there may nevertheless be germinable seeds in the packet. I may mention as instances of this Sanvitalia procumbens which (as will be seen, failed in sample) yielded six plants from the remaining seeds; so also Lobelia erinus yielded 40 plants from the computed 12,000 seeds in packet: that is, *one* good seed to 300 bad! . There are a few other species from which I have had very similar results, but they appear to me unworthy of special notice, and I have now only to add the general results of my trial sowings as shown in the following tables.

TABLE 1.—*Vegetable Seeds.*

		1 From Messrs. J. Carter and Co.				2 From Messrs. D. Landieth and Sons.				3 From Messrs. Vilmorin Andrieux and Co.,			
		No. of Seeds sown.	No. of Seeds germinated	100		No. of Seeds sown.	No. of Seeds germinated.	100		No. of Seeds sown.	No. of seeds germinated.	100	
1	Brocoli, Purple Cape, ...					100	3	100	3				
2	do. Early white, ...	100	25	100	25								
3	do. white Mammoth, ...									100	13	„	13
4	Borecole, Scotch Curled, ...	100	6	„	6								
5	do. Green Curled Tall, ...									100	4	„	4
6	Brussels Sprouts, ...	100	none							100	30	„	30
7	Cress, Curled, ...	100	44	„	44	100	31	„	31				
8	do. Common or Plain, ...									100	40	„	40
9	Cabbage, Drumhead Savoy, ...					100	11	„	11				
10	do. Early Battersea, ...					100	2	„	2				
11	do. „ Sugar loaf, ...					100	4	„	4				
12	do. „ York, ...					100	2	„	2				
13	do. Green-Turnip-rooted, ...					100	none						
14	do. Red Dutch, ...					100	8	„	8				
15	do. Carters Early, ...	100	6	„	6								
16	do. Improved Nonpariel, ...	100	3	„	3								
17	do. Dark Red Dutch, ...									100	6	„	6
18	do. Ox-heart Large, ...									100	11	„	11
19	do. Quintal Drumhead, ...									100	4	„	4
20	Cauliflower, Early Asiatic, ...					100	4	0	4				

TABLE 1.—*Vegetable Seeds,*—(*Continued.*)

		1 From Messrs. J. Carter and Co.				2 From Messrs. D. Landreth and Sons,				3 From Messrs. Vilmorin Andrieux and Co.,			
		No. of Seeds sown.	No. of Seeds germinated	100		No. of Seeds sown.	No of Seeds germinated.	100		No. of Seeds sown.	No. of Seeds germinated.	100	
21	Cauliflower, Late, ...					100	1	,,	1				
22	do. Early London, ...	100	5	,,	5								
23	do. Walcheren, ...	100	1	,,	1								
24	do. Lenormand's Short Stem, .. .									100	20	,,	20
25	do. Early Paris, ...									100	2	,,	2
26	Knol Kohl, ...	100	none										
27	Kohl rabi, Turnip-rooted Cabbage, ...									100	9	,,	9
28	Mustard White, ...	100	66	,,	66	100	57	,,	57	100	77	,,	77
29	Radish, Scarlet Turnip-rooted, ...					100	5	,,	5				
30	do. White Turnip, ...					100	39	,,	39				
31	do. Long Scarlet, ...	100	10	,,	10								
32	do. Red Turnip, ...	100	38	,,	38								
33	do Deep Scarlet Half Long, ...									100	17	,,	17
34	Radish, Early Scarlet Turnip, ...									100	25	,,	25
35	Sea Kale, ...	20	none										
36	Savoy, Drumhead, ...	100	3	,,	3								
37	Turnip, Yellow Aberdeen, ...					100	47	,,	47				
38	do. Orange Jelly, ...	100	26	,,	26								
39	do. Selected White Stone, ...	100	44	,,	44								
40	do. Early White Flat Dutch, ...									100	77	,,	77

41	do. Yellow Dutch,									100	14	,,	14
42	Beans, Lima,					20	none						
43	do. French,	20	none										
44	do. Dwarf Negro,									20	none		
45	do. ,, Flageolett,									20	3	,,	15
46	Peas, Imperial Blue,					40	25	,,	62½				
47	do. Bedman's Imperial,	40	1	,,	2½								
48	do. Batt's Wonder,	40	4	,,	10								
49	do. McLean's Wonderful,	40	1	,,	2½								
50	do. Bishop's Dwarf,									40	none		
51	do. Clamart Late Line,									40	14	,,	35
52	do. Dwarf Blue Prussian,									40	4	,,	10
53	do. ,, Alliance Mariad,									40	none		
54	do. Double Blossom Frame,									40	none		
55	do. Prince Albert Very Early,									40	3	,,	7½
56	do. Ruelle Meichaux,									40	3	,,	7½
57	do. Sugar White flowering Scimitar,									40	none		
58	Carrot, Early Horn,					100	none						
59	do. Long Orange,					100	none						
60	do. James. Intermediate,	100	14	,,	14								
61	do. Selected Scarlet,	100	3	,,	3								
62	do. Half Long Scarlet Nantes,									100	2	,,	2
63	do. Long Red Surrey,									100	5	,,	5
64	Celery, Red Solid,					100	2	,,	2				
65	do. White Solid,					100	25	,,	25				
66	do. Manchester Red,	100	33	,,	33								
67	do. ,, White,	100	15	,,	15								
68	do. Dwarf White Solid,									100	1	,,	1
69	do. Purple Giant Solid,									100	20	,,	20
70	Parsley, Curled,					100	1	,,	1				
71	do. Best Curled,	100	none										
72	do. Common or Plain,									100	none		
73	Cucumber, Early Frame,					50	4	,,	8				
74	do. Mixed Frame,	10	none										

TABLE 1.—*Vegetable Seeds,*—(*Continued.*)

		1 From Messrs. J. Carter and Co.				2 Form Messrs. D. Landreth and Sons!				3 From Messrs. Vilmorin Andrieux and Co.,			
		No. of Seeds sown.	No. of Seeds germinated.	100		No. of Seeds sown.	No. of Seeds germinated.	100		No. of Seeds sown.	No. of Seeds germinated.	100	
75	Cucumber, Long Prickly,									50	3	,,	6
76	Cream, Moore's Vegetable.	10	6	,,	60								
77	Melon, Mountain Sweet water,					10	none						
78	do. Mixed Frame,	10	3	,,	30								
79	do. Mixed.									10	7	,,	70
80	Squash, Hubbard,					5	none						
81	do. Marrow,					10	1	,,	10				
82	do. Mixed American,	10	3	,,	30								
83	Artichoke, Large Globe,					10	10	,,	10				
84	do. Crown,	20	8	,,	40								
85	do. Green Globe,									10	3	,,	30
86	Lettuce, Royal Cabbage,					100	none						
87	do.					100	none						
88	do, Dunnett's Giant Brown Cos,	100	none										
89	do. Malta Cabbage,	100	6	,,	6								
90	do. Drumhead or Malta Cabbage,									100	4	,,	4
91	do. White Paris Cos,									100	4	,,	4
92	do. Imperial Cabbage,					100	none						
93	Tomatoe, Large Red,					100	26	,,	26				
64	do. Red,	100	41		41								
95	Basil, Sweet,					100	2	,,	2				

96	Marjoram, Sweet,					100	none			100	40	,,	40
97	Sage,					100	none			100	1	,,	1
98	Thyme,									100	1	,,	1
99	Beet, Long Red,	40	16	,,	40								
100	do. Round Red,	20	3	,,	15								
101	do. Early Blood Red Turnip,									40	26	,,	65
102	do. Small Deep Blood Round Castelnandary,									40	32	,,	80
103	Spinach, Round,	100	none										
104	Asparagus, Large Purple,					20	none						
105	do. Giant,	40	2	,,	5								
106	do. „ Dutch,									20	8	,,	15
107	Leek, London,					100	none						
108	Onion, Large yellow Strasburg,					100	none						
109	do. White Spanish,	100	1	,,	1					100	none		
110	do. „ Early Silverskin,									100	none		
111	Corn, mixed,					20	none						

TABLE 2.—*Comparative Results of the trial sowings of Vegetable Seeds.*

No of Species.	1. From Messrs. J. Carter, & Co.		No of Species.	2. From Messrs D. Landreth & Sons.		No of Species.	3 From Messrs. Vilmorin Andrieux & Co.	
	Germination,	Average,		Germination,	Average,		Germination,	Average,
14	1-10 : 100	4· 8 : 100	14	1-10 : 100	4 : 100	16	1-10 : 100	4· 10 : 100
11	10-40: 100	27· 9 : 100	5	10-40: 100	26· 2 : 100	14	10-40 : 100	23· 3 : 100
4	40-60 : 100	47· 1 : 100	2	40-60 : 100	52 : 100			
1	60-80 : 100	66 : 100	1	60-80 : 100	62½ : 100	5	60-80 : 100	73· 4 : 100
8	Failed,		15	Failed		8	Failed,	
38	Total, sown.		37	Total, sown.		43	Total, sown.	

TABLE 3.—*Flower Seeds.*

		1 From Messrs. Vilmorin Andrieux & Co.				2 From the Bot. Gard. Calcutta.			
		No. of Seeds sown.	No. of Seeds germinated.	100		No. of Seeds sown.	No. of Seeds germinated.	100	
1	Antirrhinum majus mixed, ..	100	8	„	8	25	22	„	88
2	Browallia elata, ..	„	5	„	5	100	49	„	49
3	Balsam, Camellia flowered double mixed, ..	20	5	„	25	„	51	„	51
4	Chrysanthemum coronarium double yellow,	100	12	„	12	„	51	„	51
5	Collinsia bicolor, ..	„	5	„	5	25	20	„	80
6	Cuphea silenoides, ..	„	none	„		100	50	„	50
7	Candytuft mixed, ..	„	none			„	86	„	86
8	Calendula double, ..	20	3	„	15	50	35	„	70
9	Callirhoe involucrata (verticillata) ..	20	3	„	15	100	56	„	56
10	Fenzlia dianthiflora, ..	100	none			„	43	„	43
11	Gaura Lindheimeri, ..	20	1	„	5	„	71	„	71
12	Lobelia erinus mixed, ..	100	none			„	13	„	13
13	Linum, large flowering scarlet, ..	„	17	„	17	„	48	„	48
14	Larkspur, double dwarf mixed, ..	„	none			„	90	„	90
15	Mesembryanthemum tricolor, mixed, ..	„	41	„	41	„	24	„	24
16	Mignonette large flowered, ..	„	1	„	1	„	34	„	34
17	Nigella mixed, ..	„	1	„	1	„	96	„	96
18	Nolana mixed, ..	20	2	„	10	„	21	„	21
19	Nicotiana purple large flowering, ..	100	28	„	28	„	53	„	53
20	Oenothera Lamarkiana, ..	„	10	„	10	50	46	„	92
21	Petunia hybrid mixed, ..	„	none			100	58	„	58

		1 From Messrs. Vilmorin Andrieux & Co.				2 From the Bot Gard. Calcutta.			
		No. of Seeds sown.	No. of Seeds germinated.	100		No. of Seeds sown.	No. of Seeds germinated.	100	
22	Portulacca grandiflora,	100	6	"	6	100	15	"	15
23	Phlox Drummondii mixed,	"	none			"	16	"	16
24	Rhodanthe Manglesii,	"	none			"	9	"	9
25	Stock, Ten Weeks double mixed,	"	2	"	2	"	60	"	60
26	Salvia coccinea punica dwarf,	"	none			"	26	"	26
27	Sweet peas, mixed,	10	3	"	30	20	18	"	90
28	Sweet William, mixed,	100	none			100	60	"	60
29	Sanvitalia procumbens,	"	none			"	22	"	22
30	Tagetes signata pumila,	"	none			"	52	"	52
31	Whitlavia grandiflora,	"	4	"	4	"	78	"	78
32	Zinnia elegans double mixed,	20	1	"	5		2		4
33	Acroclinium roseum,	20	1	"	5	50			
34	Asters, Quilled German mixed,	100	41	"	41				
35	Aquilegia mixed,	"	1	"	1				
36	Brachycome iberidifolia,	"	10	"	10				
37	Cobœa scandens,	10	none						
38	Cosmidium Burridgeanum,	20	none						
39	Convolvulus tricolor mixed,	20	15	"	75				
40	Clarkia elegans, double mixed,	100	13	"	13				
41	Cineraria maritima silvery leaved,	"	6	"	6				
42	Carnation, extra double mixed'	"	6	"	6				
43	Cynoglossum linifolium,	20	none						
44	Daisy double,	100	11	"	11				

45	Dahlia coccinea,	20	none					
46	„ named sorts mixed,	20	1	„	5			
47	Gentiana acaulis,	100	none					
48	Heliotrope, mixed,	„	1	„	1			
49	Heartsease, mixed,	„	none					
50	Jacobœa, double mixed,	„	4	„	4			
51	Loasa lateritia,	„	none					
52	Lavender,	„	none					
53	Myosotis palustris "Forget-me-not,"	„	none					
54	Maize, striped-leaved Japanese,	10	8	„	80			
55	Maurandya Barclayana, mixed.	100	6	„	6			
56	Nierembergia frutescens,	„	none					
57	Nemophila, mixed,	„	1	„	1			
58	Schizanthus grandiflorus oculatus,	„	2	„	2			
59	Salpiglossis, hybrid mixed,	„	2	„	2			
60	Scabious mixed,	20	1	„	5			
61	Verbena hybrid, mixed,	100	1	„	1			
62	Violadorata semper florens,	„	none					
63	Wall-flower double mixed,	20	1	„	5			
	FROM BOTANICAL GARD. CALCUTTA.							
64	Argemone sulphurea,	100	1	„	1			
65	Amplyolepis setigera,	„	43	„	43			
66	Chrysanthamum Roxburghii,	„	17	„	17			
67	Centaurea sonchifolia,	„	28	„	28			
68	Dracocephalum Moldavicum,	„	2	„	2			
69	Gilia capitata,	„	56	„	56			
70	Helianthus californicus,	50	48	„	96			
71	„ lenticularis,	100	28	„	28			
72	Linum monodelphum,	„	72	„	72			
73	Lychnis firma,	„	4	„	4			
74	Oenothera cinnabarina,	„	8	„	8			
75	Papaver Somniferum fl. plena,	„	83	„	83			
76	Petunia Bertha	100	77	„	77			
77	Salvia mexicana,	„	2	„	2			

		1 From Messrs. Vilmorin Andrieux & Co.						
		No. of Seeds sown.	No. of Seeds germinated.	100				
78	Silene stricta.	,,	6	,,	6			
79	Tom Thumb Nasturtiun mixed,	20	15	,,	75			
80	Verbena Aubletia,	100	2	,,	2			
81	Vaccaria parviflora,	,,	2.	,,	2			
82	Antirrhinum mixed,	,,	61	,,	61			
83	Ammobium alatum,	,,	64	,,	64			
84	Campanula media,	,,	54	,,	54			
85	Chrysanthemum Leucanthemum,	,,	30	,,	30			
86	Dianthus chinensis,	,,	53	,,	53			
87	Digitalis sp.	,,	34	,,	34			
88	Escholtzia californica,	,,	54	,,	54			
89	Lychnis coronaria	,,	23	,,	23			
90	,, firma,	,,	72	,,	72			
91	,, dioica	,,	23	,,	23			
92	Malva Peruviana,	,,	53	,,	53			
93	Reseda alba,	,,	35	,,	35			
94	Silene pendula,	,,	64	,,	64			
95	,, longifolia,	,,	80	,,	80			
96	,, Atocion,	,,	73	,,	73			
97	,, picta,	,,	40	,,	40			
98	Salvia clandestina,	,,	20	,,	20			
99	Sweet William,	,,	43	,,	43			

TABLE 4—*Comparative Result of the trial sowings of Flower Seeds.*

No. of species.	1 From Botanical Garden Calcutta.		No. of species.	2. From Rungyroong.		No. of species.	3. From Messrs. Vilmorin Andrieux & Co.	
	Germination,	Average,		Germination,	Average,		Germination,	Average,
15	1-10 : 100	3· 8 : 100				28	1-10 : 100	4·11 : 100
10	10-40 : 100	22· 9 : 100	7	10-40 : 100	29. 2 : 100	10	10-40 : 100	20· 6 : 100
15	40-60 : 100	51·11 : 100	5	40-60 : 100	51. 2 : 100	2	40-60 : 100	41· : 100
5	60-80 : 100	74· 3 : 100	6	60-80 : 100	69. : 100	24	Failed.	
5	80-100 : 100	90 1 : 100						
50	Total sown,		18	Total sown,		64	Total sown,	

Result of sowings of Chenopodiam Quinoa at Darjeeling.
By DR. THOMAS. ANDERSON.

The seeds of *Chenopodium Quinoa* which I received last year from the Society for trial at Darjeeling were sown there in the month of May.

The experiment of growing this plant was made at four different elevations above the sea. The highest altitude at which the seed was sown was 6000 feet above the sea.

The next elevation was 5000 feet and the other two were respectively 3500 and 2000 feet. About one sixth of an acre of land was sown with the Quinoa at each of these heights The land was open clear ground, perfectly free from trees, and the soil was the best that could be found at the elevations selected. The ground was well dug and cleaned, and the surface was carefully levelled and raked before sowing. The seeds at the two middle elevations were sown partly broad cast and partly in rows. The seed germinated everywhere within a few days after sowing. The seed must have been carefully collected in South America as a very large percentage of the seed sprouted. At the two highest sites the young plants attained an average height of 6 inches and they continued to thrive until about the 20th June when heavy and continued rains began. Soon after that the plants began to disappear and by the middle of July hardly a plant remained. The cause of their failure was the condition called by gardeners "damping off'. The plants at the two lower elevations succeeded much better and resisted the unfavourable weather until the beginning of August, but at 3500 feet the plants had nearly all perished by that time.

At 2000 feet some of the Quinoa plants grew to a height of 2 feet and many of them flowered, but none of them produced seed, and on my visiting Darjeeling in the beginning of October, I could find no plants of Quinoa even at the lowest site

The seeds I gave to one or two tea planters also failed, the plants dying when they were a few weeks old. The failure of the experiment is I believe to be ascribed solely to the season of the year being unsuited to the growth of the plant It is evident that the plant cannot be cultivated during the rainy season when it is exposed to a deluge of tropical rain. I kept one lb. of the seed supplied to me by the Society in order that I might have a trial of it made during the cold season This seed has been sown and I shall in due time report the result of the experiment to the Society

Junuary, 1869.

Correspondence connected with the introduction of the Ipecacuanha to India.

(Communicated by Dr Thomas Anderson)

To the SUPDT OF THE BOTANICAL GARDENS, AND IN CHARGE OF CINCHONA CULTIVATION IN BENGAL.

Fort William, the 19th December 1868.

SIR,—I am directed to acknowledge the receipt of your General. letter No. 135 dated 8th instant, and in reply to state that the Lieutenant-Governor considers that the successful introduction of the Ipecacuanha plant would be a valuable benefit. I am therefore to request that you will take every means in your power to develop it as suggested in paragraph 6 of your letter.

I have &c.
P DICKENS.
Offg. Under-Secretary to the Govt. of Bengal.

To the UNDER-SECRETARY TO THE GOVERNMENT OF BENGAL.

Botanical Gardens, 8th December 1868

SIR,—In reply to your endorsement No. 5221 dated the

31st October 1868, I have the honor to state that it appears to me advisable that the cultivation of the Ipecacuanha plant should be encouraged in India. The memoranda by Drs. Murray, Farquhar and Ross which form the correspondence sent to me for perusal prove how valuable Ipecacuanha is in the treatment of the most prevalent and fatal of the diseases of tropical climates. Last year (1867) I received information from London that the drug is rising in value in the London market where its wholesale price is 9 shillings per. ℔. The drug (the root) is collected from plants growing wild in the Brazilian forests and is nowhere cultivated as an article of trade. Thus the already high price is likely to increase. The plant is also becoming scarce from indiscriminate destruction and by the greatly increased consumption of the medicine which has occurred within the last four years. My attention had been directed to the introduction of the Ipecacuanha plant into the Botanical Gardens of Calcutta for some years, but I was unable to procure any plants until April 1866 when one plant was sent to me by the overland route by Dr. Hooker, Director of the Royal Gardens Kew. I am indebted to the care bestowed on the plant by Dr. George King, Assistant Surgeon of the Bengal Medical service, during the voyage to India for its having arrived in Calcutta in good health.

The Ipecacuanha plant is so well-known that it is not necessary to give a full account of it. For the purpose of this report it will probably be sufficient to say that the plant belongs to the same sub-group of the natural order of plants called Rubiaceæ in which the coffee tree is placed by botanists. In habit the plant is however very different from the coffee. It grows in a diffuse semi-decumbent manner. It is found in moist shady valleys of the mountains of Brazil and extends from 8° to 20° south latitude. The only part of the plant used in medicine is the annulated root. The appearance of the plants in the Botanical Gardens agrees with the description, and the plant evidently loves shade and moisture with considerable heat, and like most mountain plants dislikes stagnant moisture in the soil in which it grows.

The plant of Ipecacuanha originally introduced into the Botanical Gardens in 1866 is dead, but I now possess 9 plants in this garden which have been artificially propagated from the original one, besides 5 growing at the Cinchona plantations at Darjeeling, to which place I sent one plant last year. I have thus 14 plants of Ipecacuanha.

I am confident that the cultiyation of this valuable plant could be carried on as successfully as that of Cinchona, provided suitable places are selected for the experiment. Until now the plants in the Botanical Gardens and in the Cinchona Nursery at Darjeeling have been grown under the shelter of glass frames which are used here for the protection of the most delicate exotics and at Darjeeling for the propagation of the Cinchonas. I am unable therefore to say from experiment what climate will be suitable for the cultivation of the Ipecacuanha plant; but it is probable that the successful cultivation of the plant in the open air in India will be attained in the valleys of the mountain ranges possessing a climate in which coffee, tea and the most tropical species of Cinchona flourish. The measures to be adopted to introduce the cultivation of the Ipecacuanha plant are, now that we possess the plant, compratively simple. The cultivation must pass through the same stages as that of Cinchona. The aim of those to whom the cultivation is entrusted should be to increase the present stock as quickly as possible, and to enable them to do so all the appliances of horticulture should be used. After 200 plants have been secured, experiments on a small scale can be made on the power of the plants to resistthe adverse climatological conditions of the situation selected on purely theoretical grounds for the cultivation.

The Ipecacuanha plant belongs to an order of plants in which a dimorphic condition of the flowers prevails, and as all the plants I possess are the produce of one plant, their flowers illustrate the floral characters of only one of those two forms. Unfortunately this is the form with long stamens and a short style, in which the power of producing seed even with a cross from the other form is least developed and which is by itself very unfertile The plant originally introduced flowered here but bore no seeds Plants possessing the other condition of the essential organs of the flower will be obtained from the plants of Ipecacuanha now in India by sowing every seed that may be procured from them Some of these seeds will produce plants having the other character of the flower and from the spontaneous crossing of these two forms of flowers, the highest state of fertility of the species will be the result Until then, the propagation must be carried on by cuttings, layers, and buds according to the methods by which the enormous increase of Cinchonas has already been attained

The cultivation of the Ipecacuanha can be carried on at the Cinchona Nursery in Sikkim. I do not say Darjeeling, for the plantations are 15 miles from Darjeeling and at 2000 feet above the sea in a narrow tropical valley. At least for the next two years the experiment will cost nothing as the same agency by which I carry on the cultivation of Cinchona will suffice for the propagation of the Ipecacuanha plants. All that is required is the permission of Government to my using my best endeavours with the means at my disposal to inaugurate the cultivation of Ipecacuanha in Bengal.

If this is accorded to me I shall divide the plants I now possess between the Botanical Gardens in Calcutta and the Cinchona plantations in Sikkim with the view of the propagation of the plants being carried on vigorously in both places. The progress of the experiment would be referred to in my annual reports of the Botanical Gardens and the Cinchona cultivation in Bengal

I have &c

(Sd.) T ANDERSON, M D

Superintendent Botanical Gardens.

A few Agricultural notes of a trip up the valley of the Jatinga in Caçhar, with an account of the India rubber tree and the mode of collecting the Gum. By CHARLES BROWNLOW, ESQ.

One of the most important tributaries to the Borak not only as regards the volume of its waters, but also on account of its trade is the Jatinga river. It flows into the Borak on its north bank, and having a short course and a rainy basin it rises with great impetuosity and frequently during floods turns the current of the Borak upwards for a long distance. Along its valley lies the road to Asaloo, and all along are settlements of Kookees, Nagas, and Cacharees. The Bazaar for the accommodation of all these hill men, is at Burkhola, situated some distance from the outlying spurs of the hills and well out on the plains where boats of some size can at all times approach. Here everything that can possibly be required by the hill men is to be found : among the articles most in demand are dhaos, poultry, eggs, salt, dried-fish, glass beads, and earrings for both beaux and belles. The dhaos are of the one sided sort used by the Munipoorees. They are scraped smooth on the flat side and sold sometimes tempered but oftener untempered, the hill men preferring to perform that operation themselves, with the juice of a creeper and deerskin charcoal—the charcoal of bamboo being always used. The poultry and eggs are in enormous demand for religious ceremonies, in which they are first offered up and afterwards eaten.

The earrings are of all sorts from the large silver ring weighing from 2 to 5 Rs., with which the Kookee delights to distend the lobe of his ear almost to bursting, to the thin brass ring of which the Naga puts a score or so into each ear. The transactions at this bazaar are almost pure barter, cotton being the main article offered by the hillmen, who seldom have any money and scarcely use it; hence in going into these hills it is absolutely necessary to carry small change, as a rupee's worth of copper can scarcely be collected in any of the villages. My object in going up the valley was chiefly to see how the India Rubber trade was managed. I also wished to see in what quantities Aloes wood was procurable, and to inspect the forest land and the mode of cultivation adopted by the hillmen; for this purpose it was necessary to leave the road on which nothing was to be seen and to go from village to village by the paths which the villagers themselves had made. The road to Asaloo lies on the right bank; it is practicable for ponies, and carries a good deal of traffic, especially on bazaar days when successive strings of Nagas pass, each contributing his part to the unearthly howl without which no Naga, especially when laden, can move. Each man carries a spear and one or more fowls done up neatly in a bamboo open work case, with the neck only protruding.

Encamping places for the night—both Naga and Bengali—are frequent along the road. They are always under Bamboo or tree shade, as in the open, and at this season, sleepers would be wet through; but no precautions are taken or required against wild animals.

The first village (Cachari) near which I was informed there were India-Rubber trees was Panighat. Here I accordingly left the road and crossed the Jatinga which is here still a broad river with a considerable volume of water brawling over a pebbly bed; it is nevertheless almost everywhere fordable. This is a feat intensely excruciating to bare feet unaccustomed to stones, owing to the slipperiness of the pebbles, and the consequent staggering about during which the feet get jammed between the pebbles.

From Panighat I went to examine a large India Rubber tree in the neighbourhood, having first procured guides at the village without which it would have been hopeless to search for it. Among forest trees and in regard to dimensions, this is "facile princeps" and there is no other not even the Banyan that approaches it in dimensions and grandeur: this may not be so perceptible in cultivated trees raised from cuttings or from seedlings planted *in the ground*, as it is never thus that the tree grows in its native forest. Whether the seed is not distributed with equal impartiality over the ground and trees I am unable to say, but from my own observation and all enquiries I have been able to make, seedlings growing *out of the ground* are unprocurable. How then, it will be asked, do the trees come to exist? This question is easily solved on the first inspection of a tree especially if young—in which case the fostering tree is very likely to be still alive. The nidus in which the seed will be seen to have been deposited is in the head of the tree, from which a cable or buttress proceeds either along the trunk of the tree or detatched and at an angle to it. Whilst in this young stage and the root consisting of a single cable or buttress, the foliage is scarcely distinguishable in that of the foster tree. In a more advanced stage the foster tree is completely enveloped with roots; the India Rubber tree requires no further support from it and finally it dies, rots and leaves a hollow. It will be observed that every portion below the head of the foster tree is strictly root and incapable of throwing out a branch, and as the head is rarely less than 60 to 100 feet high, it is no easy matter to procure a branch without firing at it with a bullet. These cables and buttresses as they approach the ground throw out smaller and subsidiary rootlets of all thicknesses down to that of twine. If any of these be cut they die below, but from above grow again downwards, not of the original thickness but subdivided.

It is only necessary to see the tree to appreciate the fearful risk encountered by the gum gatherers, who by no means confine their operations to the base but climb up as high as the roots extend and higher along the horizontal branches, chopping with their dhaus at intervals of every few inches, the cuts answering as well for their foothold as for the sap to exude from Bengalis will not risk their limbs at such work for any pay, and employ the agency of those human monkeys the Kookees who have been accustomed to it all their lives in their Jheom cultivation

Were the base of the tree alone tapped the yield would be very insignificant, especially in trees that have been frequently tapped before. And as the trees occur very sparsely and long distances have to be gone over to meet them, it becomes an object to get as much off at each cutting as possible. The tree must be twice climbed, once to cut it and a second time after the gum has dried (which takes a day or two) to gather it. This is done by pulling off the tear which gathers below the wound, which brings away with it all the gum that has exuded, and these tears have only to be moulded together to agglutinate into a ball The quantity that can thus be collected at one cutting does not exceed 4 to 5 seers.

Of course no mercy is shown to the trees, all of which (at least those that I saw) suffer severely; many I was assured are killed outright. The damage they sustain is apparent in the large cankers, and buttresses rotted off, owing to the bark being unable to heal over the frequent wounds they have received all round. The foliage is wanting in luxuriance, and dead branches and roots lying about testify to the injury in health that the tree has sustained.

The India Rubber tree is notwithstanding and perhaps because of its size one of the sparsest trees in the forest. An individual may perhaps be the only one within a square mile of country, and where more closely grouped as they are towards Luckipore and Hylakandy, they certainly rather fall short of than exceed that average. Owing to the slow growth of the trees, new growths cannot avail much in supplementing deaths. And as there are but few trees in the district remaining untapped it would appear that the India Rubber trade of Cachar, whatever point it may have reached, is not capable of much elasticity. And facts would seem rather to point to a decline, and possibly an entire extinction of the species, which would rather be accelerated than averted by a monopoly.

At present the trees are having a long respite which will no doubt do them good, but it is only owing to a clause in the conditions of Government which provides that the monopolist shall, at his own cost, plant a certain number of trees yearly To carrying out this condition most people do not see their way clearly, and it certainly is incumbent on Government to show how it ought to be done. Looking at gum gathering in an agricultural point of view, as a mode of raising the largest amount of a certain produce from the soil, it seems one of the most awkward and unscientific that can be conceived. It is not gathering produce from a given superficial area, but climbing for it, and that not once but twice; this as every practical man knows is one of the most expensive and impracticable modes of employing agricultural labour And where the labour and risk are so great as in gum gathering it comes more under the category of such employments as hunting for edible swallows' nests

There can be no reasonable doubt that the India Rubber tree is amenable to cultivation at least in an equal degree with every other tree that man has found it worth his while to cultivate; and that by substituting concentration in a plantation for the wide diffusion of the jungles, and numbers, for height and dimensions, very important advantages may be gained, and the gum certainly gathered in a cheaper and cleanlier manner than at present. Pole cuttings would probably be better for a plantation than seedlings (supposing the latter could be grown), as insuring an advanced stage of growth. Practice would soon show how the gum was to be gathered; probably the best plan would be by scoring the bark on one side (not chopping it) and leaving the other half of the bark to carry on the circulation. The following year it would be the turn of the other half, the scarifiers would go round a day or two in advance of the gatherers, to give the gum time to dry. Of course the only season in which the gathering is practicable is the dry months; during the rains the tears would be washed away before they had time to solidify. The Rubber trade of Cachar amounts to about 2000 maunds per month during the dry months (November to April). The price at which the gatherers sell, averages from 20 to 25 Rs. per maund. In some directions however, they decline to gather owing to the number of large grants there are belonging to Companies and the risk they run of having their produce seized.

The same evening I returned to the village of Panighat and passed the night there.

The Cacharis are by far the most cleanly and decent of the hill tribes on this frontier, and probably the only ones who, like the people of the plains, perform regular ablutions. They resemble a good deal the Munipoorees in features and their villages are neater and less filthy than those of the Kookees, Nagas and Meekirs. Their houses are neatly built, and on the ground instead of on muchans like the Kookees; they thatch with Mooleebamboo leaves, using the twig with the leaves attached to it, and seem to prefer them to either cane leaves or sunn grass. Outside the thatch and parallel with the ridgepole they place a couple of whole bamboos on each side, and these being well pressed down by shears, brace up the roof and make it very strong. At the same time the water gets away freely under the bamboos which would not be the case were the covering of sunn grass. In all bamboo work they are almost as neat as the Chinese.

The Cacharis are the chief cultivators of the Castor oil silkworm, and all the respectable men in the village wear a cloth made of it. The Castor oil plants are grown behind the houses, and also in the Jhooms.

Their domestic animals consist of pigs, fowls, goats and pigeons. They feed their pigs on the fragrant roots of a plant resembling the turmeric and also on the interior of the trunk of the plantain tree chopped.

Whatever may be the differences in manner and customs among the different tribes of hillmen, they all adopt exactly the same method of cultivation. Hill or Upland is always selected in preference to low, probably not so much on account of its greater fertility as because cattle are absolutely necessary to the cultivation of the latter, and these they do not possess. For Jhooming a man requires no capital or stock except his axe and dhau. Cases are not uncommon of a Cachari of the plains, who has been unfortunate and lost his cattle, leaving his low land and taking up with his hill brethren.

The village is always pitched on a spot where water is to be had all the year round. This is not however necessarily at a low elevation; on the contrary, several of the villages are at an elevation that makes them perceptibly cooler than the plains, and if a stream cannot be had they are contented with a spring.

As it is rarely possible to get an eligible piece of Jhoom land all in one piece, of a sufficient size for the wants of the entire village, the hillmen have no alternative but to take up separate pieces, often in opposite directions, the village being of course as central to them all as possible. About December they begin clearing, cutting down every thing so as to have no shade; the trees they cut down at a point as high as they can reach by the help of a "muchan" rigged up against the tree, so that the ground may be cumbered as little as possible with trunks which will not burn and which harbour weeds.

The lands that the hillmen of the Jatinga valley are obliged to content themselves with are, for the most part, of the steepest description and in many places excessively rocky. This of course very much increases the labour both of sowing, weeding, and carrying up the crops. They would very much prefer flat lands if they could get them. All such lands have been taken up for tea, and they are consequently excluded from them unless the proprietors, as happens frequently, give a village a piece of Jhoom land in return for a modicum of their labour.

In April and May, with the first rains, the sowings proceed actively, the men, women and children being all employed in dropping the seeds into little holes made with the dhau and the seeds are sown indiscriminately and come up intermixed, cotton, tobacco, and chillies appearing among the dhan. The yams are however planted near tree stumps up which they can climb, and the beans also; pumpkins and squashes run along the ground. After this three weedings are necessary before the plants are high enough to be out of reach of the weeds; but this is by no means the only labour necessary to ensure a full crop. Pigs and deer have to be carefully watched against, or they would make fearful depredations on the crops; to such expense and trouble do these animals put the cultivators that they have not only to keep night watch, but to fence in the entire Jhoom with bamboo matting, a work of no small labour. From the village the fires of these night watchmen can be seen twinkling, and they are kept up the live long night. When the Jhoom is very distant, or there is any press of work to be done, the men sometimes take their wives, cooking pots, dogs, and everything necessary for a stay and stop at the Jhoom for a week and more, sleeping in the grain house or a shed of which there are one or more in every Jhoom.

The grain sheds are generally built towards the upper extremity of the Jhoom and are provided with platforms at some height from the ground so as to make it impraticable for pigs, they are also carefully thatched and walled all round with close bamboo matting so as to ensure the dryness of the grain

When the ripening of the rice is complete, in September and October, it is cut with a sickle close under the ears and is carried in bundles to the Jhoom store house, and a quantity sufficient for the requirements of the village is daily beaten out and carried down; the husking of the paddy in wooden mortars is the business of the women. Rice is not one of the articles raised for sale; enough only is grown for the wants of the village. The Kookee or up-land rice is supposed to be more nutritive and is certainly sweeter than the rice of the plains, and it certainly sustains the muscularity of the Kookees and Cacharees; than whom more able bodied and enduring men it would be difficult to find. The grain is large, and requires well boiling or the core is apt to remain raw. The Kookees call a quantity sufficient for one meal "ek pet" (one stomach), for two "do pet" I believe they know no other measure. No inconsiderable quantity goes for the manufacture of rice wine, of which each house has an "amphora," if such a dignified name can be applied to an earthen pot, always in a state of fermentation The rice is first boiled and then treated with a ferment composed of soaked rice pounded fine with young leaves of the sugarcane; enough water is added to make a paste, after which it is moulded into cakes and placed in the sun to dry; a small piece of this added to the rice sets it fermenting, after which it is placed in a large pitcher with a straw in it, reaching to the bottom, out of which every body sucks that feels inclined. I have seen even infants imbibing the liquid with unmistakeable relish.

The Kookee uses no oil to give sapidity to the curry he eats with his rice. This mess can scarcely be called a curry, being wanting both in turmeric and oil, but is a sort of stew of yams and vegetables alone, or occasionally containing the flesh of fowls or domestic or wild pigs, but always an enormous quantity of chillies. They are not particular in their choice of animal food, and eat rats, dogs, snakes, and pretty nearly anything they can get hold of; a slight degree of putrescence is also not objected to. I should state, however, that it is only the Lenkta or lowest class of Kookies who do this. The better class or Ranglangs eat nothing, but pork, poultry, and fish ; they look down with some contempt on the others, and do not intermarry with them. All Kookies in common have the same fashion of building, *i. e* on a platform ; this sort of building involves more labour than building on the ground, owing to the extra work required on the platform which must be substantial to bear the weight of the family, and the heavy mud hearth for the cooking. Among the various Jhoom plants that have been sown, the cotton is one of the last to ripen. It is plucked by the girls who go daily and take off all the pods that have burst. The greater portion is kept for bartering ; but some is reserved to be worked up at home into cloth, which is spun and dyed as well as woven by the women The Churkee is the same as the Bengali, viz one small cylinder carrying round another, with a vast amount of creaking. The cotton is drawn out, and twisted by a revolving needle actuated by a multiplying wheel The blue dye consists of an indigo-like plant grown in the Jhooms,—and the red of Annotto. The loom is much behind that of the Bengali : it has no treadles, the alternation of the threads being effected by the hand ; the shuttle consists of a joint of bamboo, without any attempt at a wedge shape. The slowness of each operation makes the completion of a piece of cloth the work of some time, but the texture is close and neat and figured patterns are sometimes introduced. The Kookies also make a sort of quilt (purree) by twisting tufts of cotton at intervals into the texture of a coarse cloth ; they are warm but do not bear washing. The Kookies value them the more the longer they have been in the family, and it is scarcely necessary to say they never subject them to the above process.

The following is a list of Jhoom plants with their Cachari and Kookee names.

Names of Plants.	Kookee.	Cachari,	REMARKS
Castor oil,	Eeshee,	Redow,	
Pumpkin,			
red,	My-shen,	Kowkhloom moglie,	
white,	My-bul,	Kowkhloom havæ,	
Jobstears,			
Indigo,	Poindoom,	Groshoomly,	
Tobacco,	Dooma,	Tāmū,	
A sweet smelling plant used as sâg		She-nem.	
Sesamum,	Ishi.	Shib-lung,	
Beans,	Sunkhra,	Phanthai,	
Brinjall,	Muntha,		
Capsicum,	Mirshi,	Morsai,	
Yam,	Butha,	Thapoo,	
Trilobated leaf variety,	Kol-kye,		
A pungent yellow button like flower	Ansa,	Samorsai,	
Stomachic,			
Mustard,	Anchum,	Yowli,	
Rice,			
white		Mygophoo,	
black		Mygoshoom,	
red			
Amaranth, red	Parseng		
yellow	Parseng,		
Ginger like plant,	Soi pooi,		
Fragrant plant used as turkari,	Shi pooi,		

Plants grown in the gardens and enclosures of houses.

Citrus,	Mishaie'		
Plantain,	Mot,		
Hibiscus flowers,	Kaivang,		
Plum (Zizyphus),	Roroi,		
Annotto,	Bomoo,		
Marigolds,	Thanghræ,		

The Jhoom tracts, after all the crops have been removed, present a dismal waste of stubble and weeds; but it is rarely abandoned after the crop, a second and even a third year being taken out of it. The yield of course falls off rapidly, but against this must be set the total saving of labour in clearing, nothing more being necessary than to apply a torch to the dry stubble. After the third year it is a pure waste of seed to sow it in the land as the yield is almost nil. At all the villages to which I went there were general complaints of a short harvest this year, owing to the unseasonable rains. The dhan had failed to the extent of one half, and numbers of Hillmen were going out to the plains to cut dhan for the Bengalis on hire, taking their wages in kind.

The path from village to village, most of the villages being at a tolerably high elevation, involved a good deal of climbing, since the hill spurs, of which there were many, had each to be surmounted in succession. The path lay through barren looking Jhooms where the heat was stifling, alternating with magnificent tracts of virgin forest; in the hollows a stream generally flowed, at which it was refreshing to sit down for a while and take a drink of the cool water out of the bamboo.

In the early mornings the forest resounded with the clear ringing cry of the Hoolooks; and Hornbills seated on the tops of the highest tree seemed to vie with each other in uttering their loud and discordant notes. Occasionally troops of Hunoomans alarmed, bounded from bough to bough, with leaps fearful to contemplate, but without uttering a sound save occasionolly a deep "whoop." These black faced, golden whiskered gentry are easier to approach than the Hoolooks which are the shyest of all the denizens of the forest, and rarely allow themselves to be seen.

When in the vicinity of a "Jhoom" in these out-of-the-way parts it is very necessary to keep strictly to the path and not to stray, as the chances are that one or more "phangs" or snares for pigs or deer have been set; they are very powerful and capable of killing a man out right.

A species of large beetle-like spider of the most variegated colours and with a body the size of one's thumb, is very common and hangs apparently in mid air, the stays of its web being frequently attached to trees as much as 20 feet asunder. It is necessary in advancing to break them up, as the resistance in passing through them is sufficient to take the hat off one's head. The circumferential threads are glutinous;

but the radial ones smooth, silvery, and equal in strength to any silk. My Cacharees caught all the spiders they could lay hold of for their children; they told me that, roasted, they were considered a great treat. From the coolness with which they laid hold of them it would seem as if there was nothing to be apprehended from their bite.

The Nagessur *(Mesua ferrea)* is one of the most prevalent trees in these forests, so much so that with a little filling in they might be made into plantations of that tree. I saw at the Kookeepoorjees more than one splendid log which the villagers were chopping up for firewood, and it was melancholy to think that every successive year hundreds of these valuable trees, the growth of perhaps 50 years, were doomed to destruction.

Their fate would be less to be regretted if it were at all sure that at any future time the forest would renovate itself and become what it was originally; but this it never will, and nothing is more certain than that land once "Jhoomed," no longer produces timber of any value; but yields a growth fit only for fire wood.

The qualities of this timber entitle it to conservation equally at least with Teak: each successive year the demand for it is increasing and there certainly is not such an unlimited supply of it that its wholesale destruction can long continue to be unfelt.

The benefits accruing to a few savages are not to be placed in the balance with the injury and devastation they create, which are as already stated of a sort that admit of no reparation.

The damage would be less material if it took place without the limits of accessibility; these limits are however difficult to define, as what is this year inaccessible, may be worth while making accessible the next by cutting a path for the elephants.

Government is fairly taxable with want of foresight in the way it neglects to procure information regarding its forests on this Frontier, and there is probably no other civilized Government that would be guilty of similar neglect. Not a pice is expended on "woods and forests," but the whole is looked upon as waste land which, except as regards acreage it is scarcely worth while enquiring about; since it can take very good care of itself. So long as a yearly increasing toll on logs is obtained, no thought is given to the forest from which this timber is procured

Surely it would be worth while to ascertain whether any one part of the forest differs from another: where the valuable timbers are to be found in one place thicker than another; to attempt to arrive at some sort of estimate of the quantity of existing timber and of that yearly destroyed; to ascertain what trees would be best suited for filling in vacancies: and a host of other points on which it would be desirable to obtain information.

All the recompense Government receives for the quantity of timber destroyed yearly by the hill tribes is a paltry 1 R. per House. It may be said they must have hill land or starve; but this by no means follows. Kookee Nagas and Cacharees have settled in the plains before and can do so again, and there is no want of waste low lands inviting them, on which they can do no harm; or at any rate if they must jhoom, Hill lands of inferior value can be assigned them instead of their being allowed to squat where they please.

I saw no Agur (aloeswood) trees along the bottoms and. probably they have been cut away. However this may be, the Agur kumlahs I met in the valley informed me they have now to go to high elevations for it, and my own observation confirmed what they stated, as at an elevation of 1000 feet I saw several specimens, but few that had not been already cut down and explored. In one, one notch was cut which seemed to convey to the men all the information they required, which was that there was nothing to be had and it was left untouched; in another, with a singular instinct, they had followed the vein wherever it existed, with a view of seeing if there was any thing left behind. I caused what remained of the tree to be cut up, but could find nothing but a few specks and spots not worth the taking away. I also saw here a bouts several specimens of the wild Tejpat or Bay leaf—this tree though so common in Sylhet and Jynteah, does not I believe grow wild in the plains of Cachar.

The Jhulla, I saw in some quantity; and one fine specimen 15 feet in girth at the base, and tall enough to furnish 4 or 5 of the ordinary 20 feet logs into which this wood is generally cut This exceedingly useful wood meets by far the largest consumption of any in Cachar; it is used for scantling and planking for all indoor work, and for out door it is by no means wanting in durability, though of course not equalling Jarool *(Lagerstrœmia Reginæ)* or Nagessur The logs are uniformly sold in lengths of 10 *haths* or 15 to 16 feet.

The Timber is called *chalees, punchas, sait, suttoir, bœree,* according as 20 logs aggregate 40, 50, 60, or 70 cubits of girth. The prices would probably range, duty off, 12 to 14 per bær; logs ranging higher than 70 cubits the merchants object to give even for increased prices.

Jarool and Nagessur are sold by the hath length, regard of course being had to the girth; this is because they are required in greater and somewhat uncertain lengths.

I had now been six days out, going from poonjee to poonjee. The villagers were very hospitable, always giving me their palaver house to sleep in; I began however to find considerable difficulty in obtaining provisions for myself and my two men. It was not only the want of small change, but the scarcity in the villages which made them unable to spare the grain which otherwise they would gladly have given and in fact did give, but in short rations. My Cacharees, who were not hill men but got from a village in the plains, began to grumble at the short fare, and said they could go on no farther owing to their feet being cut by the stones. So after descending into the valley, I determined to encamp there until one of the men could fetch rice and other necessaries from the Buskhola bazaar. I gave him money for the purpose, and sent him off; I was however very doubtful at the time, of his intentions. Shortly after he had gone, I missed the other man also and the pleasant conviction was forced upon me that they had bolted, and I was left alone in the midst of a dense forest with two men's load of baggage to stand guard over. The asuloo road was some way off, but there was a jhoom road close to the spot where I was, and as I was by no means sure some passing Kookee might not take a fancy to my copper kettle, I "cached" all the baggage in the midst of a bamboo clump before setting out to find the nearest Kookee village, following the jhoom path backwards, and after walking a distance of about three miles, and crossing the Jatinga twice I came to Lokha noonjee, and soon made friends with Attang Kookee the head man. After partaking of the rice wine offered, I introduced the subject, and requested him to be so good as to let me have a couple of men from his village to carry my traps. I had now made up my mind to return, seeing the difficulties that would have to be encountered in going on, owing to the scarcity. Attang in a little while brought me the men, and taking his spear he offered himself to accompany me as far as the "cache." He is about 6 feet high and I could not help admiring the physique of the man as he walked in front with his supple stride. On my way back I saw 3 or 4 India Rubber trees close to the road. Wherever the road passed at a high elevation close to the river, the fish could easily be seen below in great numbers and of large size; they are very shy and cannot be approached and fishing for them with rod and worm bait is of no use; probably minnow, Spoon bait or fly would be successful.

The Cacharis and Kookees used to poison the pools and get them in that way but this is no longer allowed. The plant used resembles in its leaves the *Gela lot* which produces those large seeds used by washermen for crimping linen. The fish are now caught by men who come up from the plains with their nets, after having taken in the rice harvest. Each villager that is within a reasonable distance of the river, gets a constant supply of small fish by making a "bund" or embankment across, with pebbles at intervals along it. A long, narrow, very taper, cane of bamboo is passed through the bund, the mouth directed up stream. When the fish in *descending* once enter the mouth, they pass down until they enter a part so narrow that they are fairly jammed and unable to use their fins. For fish passing *upwards* there is a more roomy wicker-work case placed above the bund and so as to close an aperture made in it. When the fish have made their way up and through the aperture they find themselves in the comparatively still water of the case and there they remain without making any attempt to go back, though their path is equally open both ways. The fish are simply split and dried on the rocks and form a considerable portion of the sustenance of the Hillmen, but more especially of the Cacharees.

The timber drawers and their elephants had been at work all along the river, and had dragged a great deal of timber especially Jarool and Jhalla into a position for launching. Here and there, there was a log that had been abandoned and had remained for many years jammed inextricably amongst the rocks. In the lower reaches of the river I met a number of Mussulman bamboo cutters who were engaged in cutting and rafting bamboos to be conveyed to the villages; the bamboo was of the sort called Doloo, which is a very light straight bamboo, and in great demand for the "reoas" *i. e.*, the frame work of the roof on which the thatch is placed.

These men always make themselves comfortable during their stay in the jungles. They build themselves a well thatched lean-to shed, and are careful not to sleep on the ground, making a platform raised off the ground with whole bamboos laid close along side each other. These sheds of which there are a number scattered here and there through the Jungles make a very comfortable night's lodging.

The Jungle where the river enters the plains consists of Ekur grass, small bamboo, and a sort of *Bauhinia;* the flowers of the latter were white and as the tree was very abundant, it made a very elegant appearance.

At a place called Mas-pandar, I diverged from the Barkhola road, and went westwards and a few hours' brisk walking brought me out at the Bikrampore bazaar This was more in my way in going up the Sayrang river which I proposed next to explore

At Bikrampore I saw for the first time the huge embankments and tanks, made in olden times, and which would seem to indicate an ancient population in Cachar even more civilized and advanced than the present.

Note If the accompanying sketch, which is as good as I could make it, can be engraved, it will perhaps give a better idea of the tree than any description, it is from a drawing made on the spot. There is not room to give the full spread of the branches.

January, 29th 1869.

THE GARDENERS NOTE BOOK, No. 10.

The treatment of Caladiums in Bengal. By MR. R. ERRINGTON *Head Gardener of the Society; with a few additional remarks by* S. JENNINGS, *F. R. H. S.*

The Caladiums should be kept quite dry until about the middle of March, then place each in a small pot say about 3 inches diameter, first place a little drainage in the pot then fill in with rich light soil pressed in rather firm, put a pinch of sand on top, and on this the bulb, do not cover it entirely, but just leave the crown exposed slightly damp when done, and damp occasionally till started; much care is required in starting, as over watering causes decay. Keep in this size pot till a nice supply of roots are formed and foliage according, then remove to a larger size pot say 7 inches diameter using same soil as before, also water sparingly till they get a little established; as they become larger water more liberally; when this size pot becomes filled with roots, remove to a size larger, say 9½ inches diameter, using same soil as before. Each time when re-potting keep the old ball entire and press the soil in firmly, but not too hard, also water sparingly untill they become a little established. One shift may do, from the smaller to the larger size pot, but 3 re-pottings are much better than two, if from a small to a large size at once much greater care is required in watering, as a rule always watering according to condition of the plant *viz.* a strong healthy plant water freely and a weakly one very sparingly; when the plants become large allow plenty of room as over crowding induces a weakly growth and the markings become less distinct. Shading is required the whole of the growing season, but very slight, just enough to exclude the sun's burning rays at the same time admitting as much light as possible, liquid manure-water when growing freely adds greatly to strength and beauty of the leaves, but must be applied to the roots only. Horse or Cow manure answers this purpose, in proportions one part manure to three of water. Stir well together, and allow to settle, use the clear liquid and throw rest away: in addition to watering at roots, a sprinkling of water over the leaves each night when in full growth adds much to the beauty of the foliage, this should be done by means of a small can with fine rose. Should any of the leaves droop through getting too much drawn, place a thin stake, and also if too much crowded they may be spread out by placing their stakes in a slanting position. As leaves decay, or become yellow, they should be removed as they appear; about September or October they will gradually all become yellow then withhold water and expose to the sun, allow to die down, when fairly dead keep the pots perfectly dry until the starting season again arrives

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NOTES ON CALADIUM

SIZE —Varies with description

C *argyrites* is not more than 6 to 9 inches high a 6 in diameter pot will be large enough

C. *pictum,—hamatostigmum Verschaffeltii bicolor major*,—are large and spreading, will grow 2 and 3 feet high, require 18 in pot, all the rest are from 1½ to 2 feet high, and should have about 12 or 15 in pots

SEASON —In Calcutta we put them down in *March*, and they are in their full glory from June till September They dont do *at all* in the open ground Must have lots of water, the pots should stand in water when in vigorous growth —Keep in a warmish place, but only give morning sun and keep the plants protected from *Wind*

SOIL REQUIRED —good drainage *i e* at least 2 or 3 in of broken bricks at the bottom of pot, over this a little coir or *moss* then fill up with a compost of rich loam, leaf mould, and a sprinkling of silver *sand* and *charcoal*

They root freely

Their beauty consists in the markings of the leaf, not in their flowers at all

POSITION —If taken to the Hills would best be a south verandah Any how the experiment might be tried, and if they fail to grow satisfactorily more bulbs might be sent up again

They should be started, I think, if in a cold climate, in small pots, in a sandy soil, pots sunk into a manure frame, and then repotted afterwards

SAM JENNINGS

JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

Remarks on the cultivation of Silk in India. By Captain THOMAS HUTTON, F. G. S.; C. M. Z. S., *Corresponding Member of the Agri-Horticultural Society of India.*

To the SECRETARY *of the* AGRICULTURAL SOCIETY OF INDIA.

MY DEAR SIR,—In answer to your call to make a few observations on the cultivation of Silk in India, and with special reference to the Conference on this subject as reported in the Journal of the Society of Arts for 9*th.* April 1869 (No. 855 of Vol. XVII.) I now do myself the pleasure of sending a few remarks in support of the many papers I have already published upon this subject; but as from former hard work, care, and sickness, I have become a somewhat prematurely feeble old man, I must beg of the Society to kindly overlook the poverty of detail, on the plea that "*non sum qualis eram*" and can no longer so fully enter into the subject, as I might have done some few years since.

Keeping in view the fact, as I believe it to be, that the present movement in England regarding Silk, has for its object the opening up in India of new localities for the introduction and cultivation of the silkworm, it appears to me that the first thing to be done is to raise a warning voice, founded on the failures that have already, in many districts, taken place, against rushing headlong into speculations which from the very nature and constitutional condition of the insects could only end in disappointment. The fact that many such failures have already occurred furnishes valid evidence of the truth of my declarations, long since made, that such would assuredly be the ultimate result. My remarks however only then served to provoke the displeasure and sneers of sundry individuals, on the ground that I was only a meddling naturalist, and not a practical cultivator, and it was further hinted that even as a naturalist I was foolishly endeavouring to establish the existence of several distinct species of *Bombyx*, while in reality, as they sapiently insisted, there was but *one!* On this point, however, events have fully justified my views. Thus naturalist or no naturalist, since one of my opponents facetiously and elegantly remarked that "the proof of the pudding was in the eating," facts have in both instances declared that "*magna est veritas et prevalebit;*" while the peculiar pudding that my friend was concocting, turned out by some mistake to be—*a hash!*

I was not, however, the first to point out that the climate of the North-western Provinces was unsuitable to the constitution of the mulberry silkworm, Dr. Royle having come to the same conclusion long previous to the time when I entered upon the subject.

As the subject of Silk cultivation in India is of vast importance both to this country and to England, and Mr. P. L. Simmonds not having fully exhausted the subject, I shall endeavour to add what little information I may have picked up since the publication of my last papers on the cultivation of Silk.

Experience having shown that while the hot lowland plains are wholly unsuited to the constitution of the annuals, and that the *multivoltine* species on the other hand are checked by the want of leaves for a longer time during the winter season than their period of rest can meet, so that the young worms again appear before there is a sufficiently abundant supply of food, it is clear that the efforts of cultivators should be confined only to those parts of the country in which the worms have thriven well and profitably; so that while Bengal should redouble her efforts to increase the stock and quality of the silk of the multivoltine species that have hitherto, in spite of much mismanagement and want of proper care, manifested their ability to ensure good returns, the annuals should be altogether confined to suitable elevations in the Hills from Sylhet upwards to the Indus. Experimentalists who know little or nothing of the constitution and actual condition as to health of the species they would introduce, and who set common sense and experience at defiance, are simply acting upon the *sic volo sic jubeo* principle, and are certain in the end to throw away their capital. Even in an elevated position there are many points to be considered before entering upon such a speculation: imprimis, plenty of capital; *2ndly*, the nature of the climate of each district, for it does not follow that the same elevation will be equally suitable to the worm at Simla in the North and at Darjiling to the Eastward, the elevation may be the same but owing to a difference of latitude the climates cannot be the same; *3rdly* the species of worm best adapted to each climate; *4thly* the prospect of a remunerative return upon the outlay, founded upon sound logical and inductive reasoning, and not as hitherto upon mere surmise and guess work. It must be borne in mind that although good silk may for a time be produced while the health of the insect is unimpaired, even in a climate which will eventually prove injurious to the worm, yet the out-turn will never be what it ought to be in a climate fully adapted to the constitution of the insect. Good silk was no doubt produced both in Oudh and in the Punjab, but in neither case was the yield commensurate with the outlay and expectations of the cultivators.

Therefore, I ask "*cui bono*"? For if you can only produce good silk by an outlay of double the value of the crop what kind of a fortune are you likely to make? In short no yield of silk that does not fully cover every item of expense, *leaving the insect in its original strength,* and bringing in a really profitable return, is worth the trouble of cultivation. For the question to be solved is not so much whether a district will *for a time* produce good silk, but whether it will do so *permanently* without having recourse to annual importations of fresh seed; and also whether from a given number of worms it will produce a return equal to that from a similar number of worms, and at no greater outlay, as Bengal or Cashmere. Facts, we all know, are stubborn things, and they have already solved the question by proving that the Upper Provinces are wholly unsuitable to either annuals or multivoltines.

A word likewise must be said regarding the quality of the food upon which the worms are reared. Much has been said on the score that the facility of rearing mulberry trees proves that India is a country adapted generally to the successful cultivation of silk; yet this is entirely a fallacy supported by very indifferent logic, for the worms are not generally fed upon *indigenous* trees, but upon trees from time to time imported from foreign countries possessing climates often quite at variance with that of India. That such importations apparently grow well and look healthy, furnishes no proof whatever that the constitution of the plant is sound and that the nourishing properties of the leaf remain unimpaired by the change of climate; no experiments have been instituted to ascertain this point, but the logic seems to be that a mulberry leaf is a mulberry leaf, and as the natural food of the worm is the mulberry leaf, therefore, they must thrive equally well upon every species! Yet when we reflect that multivoltines prove themselves to be the creatures of warm climates, while annuals are restricted by nature to the north, is it not reasonable to inquire whether each individual species may not originally in its native climate have been furnished with some particular tree upon which it throve better than upon others? It must at least be evident that the annuals of the north could not have been nourished upon trees that are peculiar to the south, and *vice versâ.* To feed the northern worm upon the finer leaf of the southern tree would be nothing better than a silly attempt to destroy its constitution by slow starvation!

That some leaves are preferred to others, every cultivator must have seen, and during my experiments to restore the health of *B. mori.* I often found that although sometimes when pinched by hunger some of the multivoltines would sparingly eat of the leaves of the coarse wild mulberry of the hills, yet on the supply being intermixed with the leaves of the China mulberry (*Morus Sinensis*) the former were at once abandoned for the latter; while as to *B. mori,* although a northern species, it would never touch the wild leaf at all. Nor does the above opinion appear to be wholly unsupported by facts, for the wild silkworm *(B. Huttoni),* of the North-western Himalaya must have been wholly restricted to the coarse leaves of the indigenous trees previous to the introduction of the cultivated Chinese plants, and indeed in many parts of the Hills they are so still. That they readily eat the leaves of other mulberry tress is nothing to the purpose, the question being did nature restrict them to any particular tree? The answer being—undoubtedly she did until man interfered to upset the arrangement. Another point to be considered in the rearing of northern worms upon southern leaves is the fact that, from their thinness, twice or thrice the quantity will be required to properly nourish the worm and this increases the outlay; besides which, the longer the time consumed in feeding, the less repose does the insect receive and this is injurious to its well being.

But supposing, as is most probably the case, that the leaves of imported trees in an uncongenial climate are deficient in proper nourishing constituents, the worms and consequently the crop of silk must likewise be affected, and the very same thing arises from the injudicious method practised in Bengal of constantly cutting down the bushes for the nourishment of the worm; for in such cases the leaves are wholly immature, watery and poor, and therefore do not furnish the worm with the necessary constituents for producing good silk, while the quantity must likewise be reduced. Doubtless the natives will tell us that this is the cheapest method, and they can afford no other, and this may be true, but the purchaser of cocoons should be wiser in his generation and remember that as *Veal* is not *Beef* so in like manner are young mulberry shoots inferior as an article of food to the mature leaf. The niggardly policy that would put every shilling into the pockets of the cultivators and bestow nothing upon the worm and its produce, is the very worst that could be adopted and is decidedly one of those causes which have hitherto led to such lamentable and disastrous results. A thorough revision and alteration of the prevailing system is absolutely necessary, and if the purchaser of cocoons does not strenuously endeavour to repair the mischief which is manifested in the failing constitution of the multivoltines of Bengal, he will soon have reason to bewail his negligence.

Now it appears to me that the great number of mulberry feeding silkworms now known to exist, amply warrants the conclusion that a corresponding variety of trees has been furnished for their nourishment, each probably being modi[illegible] suit the climate and other conditions under which the worms themselves may have *originally* existed. Some perhaps may have been restricted to one species only, while others may have had a wider range, for had not something of this kind been intended why has such a variety of mulberry species been created? If all worms throve equally well upon the same species of tree in every climate in which indigenous, why create such a number of other species, many of which probably differ in specific properties? It would seem to prove only a waste of power and resources, and be consequently inconsistent with nature's laws and usual course of procedure which is never to act redundantly.

Granting then that the variety of trees corresponded with the variety of the insects, it would appear that we with our conceited notions of *improving* upon nature, have at last so intermixed and deteriorated the quality of the natural food of each, that our boasted improvements, as Mr. Bashford called them, have nearly ended in the destruction of the worms.

It may probably be said that there is now no remedy for this state of things as so much time has elapsed since the introduction of the insects that no one now remembers upon what trees they were originally fed, and even in some instances from whence the worms themselves were procured. The objection I think is scarcely valid, and if we are really seriously inclined to repair as much as possible the evils and mismanagement of the past, it behoves us manfully to push all difficulties aside and commence *de novo* upon a sounder system. The French appear to find no difficulty in procuring eggs from foreign lands,—then why should we? Practised hands could surely be despatched to China and its isles, in search of stock, and the *indigenous* (not imported) trees of the district. These once obtained would fairly replace the cultivator upon his legs, and instead of making the supplies over to the natives, each cultivator of silk should have his own plantations, and all other necessary requirements in his own hands and under competent European Superintendents. The present native system should be rooted out, for it is nothing but a patent method of reducing the yield of silk and gradually starving the worms. It is of no use crying to Jupiter to give you better corps,—you might just as well invoke the Saints with a farthing rushlight;—the speculator must himself gallantly put his own shoulder to the wheel, and so earn a right to the aid of Jupiter. But supinely to sit down and pursue the present system can only gradually and surely tend to the eventual destruction of the Insects.

I have treated the subject as a naturalist, because he, from his knowledge of the habits and requirements of the insects, ought to be the proper person, in the first instance, to lend a helping and a guiding hand to the cultivator. More than this I cannot do as I am not sufficiently versed in commercial politics to enable me to step forward as a practical sericulturist.

Some have imagined that as the annual worms of Cashmere cannot be successfully cultivated in Bengal, it would be wise to cross them upon the monthly worms in the hope of thus obtaining more than one crop of cocoons of a superior size, a method which has always appeared to me to be a patent way of destroying the good qualities of both. For the blood (so to speak) of the annual Cashmere worm being as it were prepotent over that of the multivoltines will speedily reduce the cross to annuals, and so destroy their good qualities, while at the same time the inferior size of the monthly worms as compared with the cocoons of *B. mori*, acts injuriously in reducing the size of the cocoons of the latter. Mr. Bashford, on whom well merited praise is bestowed by the Conference, was for a time perfectly unreasonable on the subject of crossing and became highly indignant at my declaring, what eventually proved to be true, that all would sooner or later revert to their own natural characteristics, or be swallowed up in the stronger annuals. "Look,"—said Mr. Bashford.—"at our breeding establishments in England,—horses, fowls, sheep, &c &c; every thing is most successfully crossed, and the improvements are permanent."*

Yet this is after all but idle talk displaying a decided want of knowledge of the subject, since no "*improvements*" either are, or can be, *permanent* unless the crossing is from time to time renewed, and the animal kept up to some required standard. If this be not attended to the animal, be it what it may, when once left to nature will gradually revert, and all the boasted improvements become obliterated,—and why? simply because the standard is wholly an artificial, and not a natural one! Mr. Bashford however appeared to be surprised to see his worms revert, and that nature, abhorring all crosses, exercised a greater influence over the worms than he did. I will quote a portion of his concluding remarks, placing those parts which support my argument, in italics. "On my return from Europe, I found a good supply of healthy looking eggs of the different sorts, and have continued the experiments this year (1856) with unabated perseverance; they began hatching early in January, *but just as irregularly as before*, a small quantity only came out daily, and did not cease till May. The early worms were all good, fed and thrived as well as I could desire, and cocoons from them were very fine.† I had an opportunity of again comparing the pure French cocoons reared by me, with the different crosses, and the choice *was greatly in favour of the pure;* but the cross cocoons were vastly superior to those of Bengal, and what I reeled off in the filature, gave a most beautiful silk, and a yield in quantity more than twice as large as the common cocoons of this country, which we were then reeling in the filatures. Thus, much of the intrinsic value of the French cocoons remained, but none of their original shape. I supposed now that I had so much reduced the original nature of the frequent crosses, as to be nearly certain of their now assimilating in habits &c. &c. with our country worms, and *I did not reduce them by further crossing* but allowed the moths to couple with themselves.

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* Note on Hutton's remarks on the improvement of Silk-worms.

† This cross was effected with French, Italian and China females of *Boropooloo*, upon *Madrassee* and *dasee* stock.

Great was my astonishment to find after the eggs had been deposited three days, that most of them turned black, *indicating that they still had too much French nature;* a few remained yellow and hatched after ten days: how to account for this freak of nature with regard to the rest, I cannot understand, but I had still to be more surprised after this. I have to wait of course until next year to see the result of the black eggs, but those that hatched gave me ample occupation for the time, and I watched and cared for them with the greatest interest; the young worms looked healthy, ate and throve well, and in due time gave cocoons, the white colour alone proved the China portion, and the superior size of cocoon and fibre, and lighter colour of some, with less floss than with our common sorts, shewed the French and Italian cross. I was on the whole satisfied with this crop, and trusted my labours had met with success, but great was my astonishment, after the pairing, to see more than half of these eggs again revert to annuals, though there had been *a complete break in their nature* by their having hatched in January; given cocoons in February, eaten out in due time, paired in themselves, deposited eggs that ten days after hatched, and now to fall back not to hatch again until the ensuing January of 1857, *I fancy is extraordinary in the extreme.* I have many pounds of eggs of the different crosses still retaining the nature of annuals, but as I have spent three years in trying ineffectually to engraft a superior nature, and invigorate our common stock without changing their nature of hatching, I feel discouraged, and would gladly have the opinion of naturalists, as to the probability of my object ever being attainable and the proper steps to be taken for realizing it."*

It was in consequence of this pathetic appeal to naturalists that I wrote to Mr. Bashford a letter which he published in your Journal and which ended in obtaining me the honor of a *Snub* because my opinions were not in accordance with his wishes. Yet subsequently he acknowledged the utter failure of his endeavours and that the worms had all reverted to annuals.

The parts italicised in the foregoing extract, are these:

First,—'*the irregularity of hatching;*' showing that the cross was already acting injuriously upon the eggs.

Secondly,—'the choice betwen cocoons of pure French stock and those of the cross, was altogether on the side of the former'.—Proving the *unmixed* to be the best.

Thirdly—fondly imagining that he had succeeded in amalgamating or fusing the two natures, he did *not reduce them by further crossing,*—and what was the result? Simply that from the moment when crossing ceased, nature stepped in and asserted her authority by again casting out the effects of the cross and causing the hybrids to revert to annuals. In this likewise we perceive the folly of declaring that "everything is most successfully crossed, and the improvements are permanent." I can only suppose, if this be the fact, which however it is not, that there *were no improvements* in these hybrids to become *permanent!*

Fourthly—the dark colour of the eggs 'indicated that the hybrid had still too much French nature;' that is to say that the influence of the stronger *Boro-pooloo* (B. textor) was prepotent over the weaker monthly worms and had reverted them to annuals!

Fifthly—the worms became annuals "after there had been a complete break in their nature !" The fact is otherwise,—there had been no break in the nature of either species, but simply dire confusion for a time, succeeded by reversion to their natural condition, by which the temporary union was dissolved and again contemptuously cast out.

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* A few remarks "On Experiments with Silkworms" by F. Bashford Esqr. *Journal A. and H. Society of India, Vols. IX and X.*

Sixthly.—Mr. Bashford thought it a very extraordinary thing that reversion should have succeeded to what he considered the accomplishment of his wishes; yet there was nothing extraordinary throughout these changes, they were simply indications of a struggle between Nature and Mr. Bashford for the mastery, the one being determined if possible to preserve her species pure, and the other if possible to destroy them by the application of what he termed "*The Arts and Sciences!*" However, the long and the short of the matter is that all these experiments signally failed, as fail they always will, and I therefore advise the cultivator if he wishes to possess good silk to eschew all crossing, and to busy himself with a more careful management of the pure races. Such experiments are well enough in the hands of a naturalist who wishes to learn what can possibly be effected by such crosses, but for a practical sericulturist to enter into them will ever prove but time and labour thrown away.

Let us now consider the subject of silk cultivation in India from another point of view. The first thing that appears to arrest attention is the ardent wish in England to extend the cultivation of the worms generally over districts where at present none exist. I have however already shown that this desirable object cannot be obtained; all efforts, and they have been zealously pursued, having failed with considerable loss. Let not the sometimes over earnest advocate for such extension, run away with the very erroneous impression that all parts of India enjoy the same climate and are equally favourable for the growth of silk, for nothing can be farther from the truth. The very geological features of the land will at once point out that from the coast line upwards for more than 1200 miles the climates must necessarily be modified by outlying hills and mountain ranges of considerable elevation. These mountains are often densely clothed with forests and other vegetation, at other times are bare and rocky, and while well adapted in many parts for the larger wild species such as the Tussar *(Antherœa paphia)* and its congeners, are totally unsuited to the growth of the finer silks. Yet these wild species are by no means to be despised, and excellent silk is even now turned out at Beerbhoom, Palamow, Bhagulpore, and lately at a place near Sasseram. The cocoons of Palamow, especially, are sometimes of very large size, and in all these, and such like localities, careful management in reeling appears to be all that is necessary to insure a very profitable return. The worms are wild, and are fed upon the forest trees, at no expense to the cultivator, who consequently does not experience the same temptation to turn rogue and starve the worm, as is the custom among the Bengal cultivators of the monthly Bombyces.

The group of silk spinners of which I now propose to speak, differs widely in form, in habits, food and silk from the Bombyces proper; they are all wild species, and what is a great advantage, are all indigenous to this country and widely diffused wherever there are hills. The type of the group is the well-known Tussar Moth *(Antherœa paphia)* which occurs not only at the places already mentioned, but likewise along the coast line from Bombay through Pondicherry and Eastward to Bengal, and thence through Cachar, Assam, Darjiling onwards through the Dehra Doon, and even to the Punjab. The insect therefore has already indicated to us the various localities in which it may be expected to thrive; there is no need of experimental trials, for Nature has declared that wherever her species are indigenously placed, that is the locality in which they are certain the thrive best, so that knowing this, all that the sericulturist has to do, after the selection of the district in which he proposes to reside, is careful attention in the selection of cocoons, and the finest manipulation in the reeling. At present this silk as an article of commerce is altogether in its infancy.

All the species of this group, and there are several, are wild, and as a rule, when left entirely in a state of Nature, appear to be only annual, or single brooded, yet such is the curious effect even of a semi-domestication that no sooner do they become subject to man's control, than this habit is completely changed and from two to five broods a year may be obtained. The occurrence of a strong sharp pointed horny spine at the shoulder of the wing in *Actias Selene* and others of that genus, and its presence likewise in *Antheræa*, sometime ago suggested the propriety of ranging these in a separate family under the name of *Plectropteronidæ* and genus *Plectropteron*, but as the suggestion appeared to meet with little favour, I did not venture to make the alteration. The mere fact of *Actias*, possessing long narrow tails to the lower pair of wings, while there are none in *Antheræa*, would not, I conceive, have sufficient weight to prevent the amalgamation of the two genera which, in other respects, present but few if any generic differences; for the very same thing occurs in the *Papilionidæ* or Butterflies of the genus *Papilio* between which no difference is made on that account. As we are not, however, here concerned with the *tails*, but with the *produce* of the insects, and their capability of being turned to good account as Silk producers, we may for the present let the scientific question rest.

In all the members of this group the cocoon is firmly closed all round, and the fibres, especially in *Antheræa*, are strongly and compactly glued together so as to render the action of the wing-spur necessary for the separation of the threads. The head of the cocoon therefore being first moisfarted as in *Bombyx* by a liquid secretion from the mouth of the insect, the wing spines are then alternately brought into play in making a cross cut, or it may be perhaps in separating the threads without cutting, a sharp grating sound being plainly heard the while, until the moth effects its exit. The silk when reeled, although, from the great size of the insects, coarser in the fibre than that of *Bombyx*, is nevertheless a valuable product, and with good reeling would soon command a very profitable price.

In *Actias* the cocoons are by no means so full of silk as those of *Antheræa* but what there is has been well spoken of as—"strong, tenacious, elastic, and brilliant." At Mussooree the worm of *Actias Selene* is found in a wild state upon the *Andromeda ovalifolia, Coriaria Nipalensis, Xanthoxylon hostile, Bradleia ovata, Carpinus bimana. Cerasus puddum*, (the wild cherry) *Pyrus kythul* (wild pear) the Walnut and others, so that there should be no difficulty in rearing it on the cherry, pear and walnut either in France or England, and as it will yield three or four crops in the year an abundant supply of silk might be obtained, the worm being as easily reared in the house as on the trees. In India it has wide range, occurring along the coast line from Pondicherry, eastward, along the base of the Himalaya even to the Sutlej in the North West, and it has been found also in Central India, so that there can be no question of its being rendered otherwise than productive in this country.

Of the Tussar-I have already spoken and shall only now remark that in the whole family of the Lepidoptera there is perhaps no insect so variable in the imago stage in point of colouring as this; so much is this the case that a novice would scarcely believe the varieties to be all of one species. I have a cabinet now before me of silk spinning moths, in the drawers of which there are no fewer than a dozen variations chiefly from Palamow. There is likewise a species, for I am much inclined to regard it as such, from the

Sonthal jungles some miles to the westward of Colgong, and procured through the kindness of Mr. Barnes. I have received it from no other part of the country and have provisionally named it *Antheræa nebulosa* from the cloudy bands on the wings. The cocoon is in all respects like that of the common Tussar. I have also some which if not crosses between *Anth: paphia* and *Anth: Frithii* must be new also.

Antheræa Assama, of Assam occurs also sparingly in the Dehra Doon, and could a brood be once procured would doubtless soon become a very profitable speculation. The great difficulty however is to find persons capable of discriminating and willing to assist the experimentalist in procuring eggs and cocoons from various districts. If we had but a Mr. C. Brownlow, a Mr. Barnes and a few other equally liberally minded men in every district what a glorious harvest might be made.

In parts of the Himalaya, and more especially in the North West, about Mussooree and Simla, there occurs a fine species known as *Antheræa Roylei* feeding on the Oak, the silk of which is also excellent and could easily be reared in considerable quantities by tying the females out at night or placed in coarse gauze tents or cages, the wild males being almost certain to visit them before the morning.

In 1867 I received from Dr. Wallace of Colchester, a few eggs of *Antheræa Yama-mai* of Japan ; very few hatched and although they gnawed at the oak leaves *(Q. incana)* for two or three days, the worms then shrivelled up and died. I have now a small batch of the same received from M. Gúerin Menéville but none have yet hatched and from their appearance at present I fear that none will do so ;— *Mais nous verrons.*

Of the Eria group *(Attacus)* little need be said save that the Ailanthus worm, *Attacus Cynthia,* is abundant at

Mussooree, and occurs along the Terai region through Kumaon, eastward to Cachar, it is the species which I formerly named *A Canningi* and which the French persist in calling by that name although it is nothing more than *Attacus Cynthia* This might be reared in any quantities either on the *Ailanthus glandulosus* or on our native plants such as *Coriaria Nipulensis*, *Xanthoxylon hostile*, the Woodbine and other species, but some difficulty would probably be experienced in the reeling As to *Attacus Atlas* I scarcely think now that anything can be done with it on account of the difficulty in procuring eggs, the worms thrive well when found and taken from the jungle but I never could induce the moths to breed At Mussooree however we appear to be on the confines of its range but it is abundant in Kumaon and extends eastward to Cachar. Here it is found chiefly if not as I suspect altogether, upon the long milky leaves of *Falconeria insignis* while in Kumaon the Barberry appears to be its favorite food As with *A Cynthia* the difficulty of reeling will be somewhat troublesome but the silk is decidedly good

Here surely is range enough for the cultivation of silk, for it literally carries us throughout the country, there is no need to institute experimental trials as was done with the Chinese Bombyces, the sericulturist has but to select the locality in which he finds the worms abundant and labourers at hand and then by strict attention to the proper rules of feeding and reeling, he can scarcely fail to realize good profits But beside this how many as yet wholly untried species are there to be brought under cultivation for the first time! Some even whose existence is only as yet suspected, and which will have to be carefully sought for by an experienced eye Some years ago when I asked permission to start upon such an errand, the Government answered that "the subject was far too scientific to be entertained," and my application was consequently refused.

Now I am somewhat too old and shaky to carry out the wishes of those days to their full extent, and yet if those worms are to be sought after and cultivated somebody will have to do the work or half the resources of the country in this branch will be cast away. There is no reason however why the question should be "*too scientific*" for a practical sericulturist, because it was so for the Government Officials of those days! If the cultivation of silk in India is to be extended in earnest, it is with these wild worms that the game must be played, for we already know that nothing can be gained by introducing the *Bombyces* of China into localities where experience has shown us that they cannot thrive.

As when the trumpet sounds the old war-horse is said to sniff the battle from afar, so the trumpet you have sounded in my ears, has in some measure reawakened a wish if possible to be of use in this important matter, and temporarily shutting my eyes to the disgust engendered by the treatment I have hitherto received from various Governments as the reward of my long continued endeavours to assist the sericulturist, a disgust which tempted me to cast to the winds the experiments of several years, I shall still be happy if by my advice and the little assistance I may be able to give, I can in anywise promote the views and wishes of those who are now bestirring themselves in the matter of silk cultivation in India. In saying this however, I must frankly confess that I am now but "the miserable remains of an ill spent life" and have no longer either the health or the strength to enter into much field work, and yet if I could procure good living samples either of the eggs or cocoons of the various species of *Antheræa* such as *A. paphia,* of Palamow, and of the district round Colgong; of *A. Frithii* *A. Helferi* and *A. Assama,* I should be very much tempted to begin my experiments again; with Bombyx I will have no more to do, for I am convinced that if any thing worthy of the name of *silk extension* is to be effected it must and can be done only with the aid of the hitherto too much despised and neglected wild species. Old friends however who some years since most liberally assisted me in procuring what I wanted, have either left the districts from which my best specimens were procured, or as in several instances have departed as I hope to happier hunting grounds.

Antheræa Assama in particular is a worm in which I have always had great faith, and still think that it might become of the gratest value, yet I have never been able to procure its eggs or cocoons in sufficient quantities to enable me to judge from actual experiment, what might eventually be effected. As to Mr. Moore's imaginary species which he has named *Antheræa mezankooria*, its existence as a species distinct from *A. Assama* is in my opinion altogether apocryphal, the word "*muzankooree*" being applied by the Assamese not to a worm distinct from *A. Assama*, as he has been led to suppose, but to a particular quality of the cocoon and silk of the latter, precisely as in Beerbhoom the assorted cocoons and silk of *A. paphia* bear different distinguishing names though all are procured from the same species.

A parting word now with respect to the cultivated Mulberry Bombyces.

1. The common mulberry silkworm or type of the northern worms is the well known *B. mori*, the largest of the genus known in India and generally called in this country the Cashmere worm, although equally well known throughout Afghanistan, Bokhara, Persia, Syria and all Europe. If this be one of the species which it may be thought advisable in spite of experience to introduce into the Plains, I say again *Beware*, for the result of such an attempt will only prove the truth of the old adage that *a "fool and his money are soon parted."* In the hills of the North West no doubt suitable localities and elevation may be found, but I confess I do not consider Mussooree either sufficiently elevated or

far enough North, to enable any one to work the worm with full success, or extract from it all that it is capable of yielding. The district of Kunawur, I should imagine, would be as fine a field for the cultivation of this species as any locality in India or throughout the Himalaya. The lower part of the valley experiences far lighter rains during the monsoon than are experienced in the lower hills near Simla while the upper part towards the Tartar frontier, is altogether out of the reach of the monsoon. It is precisely because this is the case that the district yields such good grapes, while in the Sub-himalaya they are acid, and watery and of little worth. Hops doubtless would there thrive equally well; they grow luxuriantly even at Mussooree but there the heavy rains act injuriously in preventing the formation of the seed; the plants flower well, but as the bitter principle resides most strongly in the seed the value of the hops is almost nil. Like the grape, however, the plant might in Kunawur arrive at full perfection and be rendered serviceable to the brewers in the lower hills. Why then should not such a district be equally favourable to the growth of silk? The elevation and the temperature might be selected according to the requirements of the insects, for the valley is a wide deep trough through which the Sutlej flows and with shelving sides and fields cut out in steps; here too the worm would be actually on the confines as to latitude of its native land, the Chinese districts from which it originally came lying as does this Himalayan tract between 32° and 34° of north latitude. Cashmere might likewise receive a helping hand.

2. *B. textor* (Hutton), the Boro-poolloo of Bengal, and which is apparently fast fading away, being likewise an annual would no doubt thrive equally well in the same district. The cultivator however, might be surprised to find that the crop of silk derivable from these, although at first of a silvery white, had now all turned to a golden yellow, the effect as I maintain of returning health and strength.

3. No monthly species could of course be expected to thrive in such a land, and consequently would not be introduced. These must be left entirely to the climates of Bengal and the western coast line.

The object to be gained by the cultivation of all these species should not be their extension into other districts where they have never yet been found to yield a successful crop, but to rouse the sericulturist from his present sleepy state of apathy and teach him that silk can only be increased in quantity and improved in quality by a proper attention to the condition of the food upon which the worms are fed; if he is too idle and supine to do this and positively insist upon an improved system among the natives from whom he obtains cocoons, then farewell for ever the expectation of ever profitably introducing the cultivation of silk in India,—change the name of Bengal into that of "*Sleepy Hollow*," and let those valuable insects go dwindling downwards step by step until the whole are either lost or worthless. The present system is altogether wrong; in saying this I feel that I am again travelling along a road that formerly was productive only of sneers and ill-will, but that I little heed; my wish is, if possible, to benefit those who are now, or who may hereafter be engaged in the cultivation of silk, and therefore I am determined to speak only that which I believe to be the honest truth. Improvement in the method of producing food,—improvement in the quality of the food itself,—improvement in the actual *quantity* of food furnished to the worms and which a native will always stint,—improvement in the smoky, dark, ill ventilated huts in which the worms are reared, and which like Irish cabins appear to contain a regular Noah's Ark. These are at least some of the improvements to be effected before any increase in the quantity of silk can be expected. There is in truth no difficulty in this beyond that which the pig headed native obstinacy of the rearers opposes to all improvement; what then? is your silk to stand ever at the same low standard, because an avaricious grasping ignoramus is determined to pursue that course alone which an equally ignorant "*Papa* pursued before him?" Go to,—you must entirely "changez tout cela," and take every branch of the system into your own hands; the trees, the mode of cultivating them, and the rearing houses,—in short from first to last, everything pertaining to the growth of the finest silk, must be taken over *in toto* by the sericulturist, whose money, whose common sense, and energy of mind and body must all be invested in the speculation. It is the "Master's eye that makes the horse fat"—and the very same principle applies equally well to the cultivation of silk. Pursue this system if you wish to thrive; if otherwise, then you must be content to remain as the drill sergeant says—"*as you was*"!

4. The wild mountain species known as *Bombyx Huttoni* is in some seasons found in thousands; every mulberry tree whether wild or cultivated being literally covered with them. The worm is double brooded, and the eggs remain exposed to the inclemency of a mountain winter securely glued to the bark of the tree. The silk is decidedly first rate and of an ashy white colour, but the insect is so intractable that it will not submit to domestication and must therefore be reared upon the trees, a method which must always render the crop precarious. I have repeatedly tried to introduce this species into France and England but always unsuccessfully, the reason being that while our worm hatches in early March when the young mulberry leaves appear, in England there is not a leaf procurable until May. I therefore propose (D.V.) if alive this coming autumn, to convey a bundle or two of cuttings to my friend Dr. Wallace of Colchester, of the wild mulberry tree, in the hope that they may find a congenial climate somewhat resembling our own in this "*Ultima Thule*," and so

continue to put forth their leaves at the season when the worms are hatching; it may be considered as a wild attempt and forlorn hope, but nevertheless the value of the ultimate results in case of success proclaim it a venture well worth trying.

I have lately read, although I cannot at this moment remember where, that what are termed the perforated cocoons of the Bombyces, that is of cocoons from which the moths have effected their escape, are contrary to received opinions, quite capable of being reeled off like the others, the silk not having been cut, but only pushed aside. If such be the case the cocoons of other species may likewise be turned to profitable account, and a large additional quantity of silk be saved.

In the supplement to the Oudh Government Gazette for May 29th 1869, appeared a communication from "The Silk Supply Association of London," upon some portions of which I propose to make a few observations for the benefit of those who are far more prone to be led astray by the sophistry extant in high quarters, than to be guided by hard facts and the experience of the past. Gentlemen in England are very apt to take a purely English view of silk cultivation in India, and appear to think the natives of this country are such a docile and teachable people that they will readily lay aside "the superstitions of ages," as upheld by their ancestors, and adopt the suggestions of foreign speculators who in many instances are as far from pointing out the proper course to be pursued, as the natives are slow in adopting it. Thus Messrs. Chadwick and Dickins, at a Meeting in London convened by themselves, propose, first "to stimulate the production of silk by Cottage cultivation and otherwise in every country where the Mulberry tree is capable of giving food to silk-worms." In this first clause as stated by the Association, there are two points to be considered which appear to me more likely to prove injurious to the worms, than to extend the growth of silk. These are, first—"The production of silk by Cottage cultivation," and secondly—the introduction of silkworms wherever the mulberry is capable of giving food to the insects."

Now, if by "Cottage Cultivation," is meant the rearing of silkworms by cottagers in Europe, the thing may probably be feasible enough because the people being of cleaner habits, and more alive to the absolute necessity of attending strictly to the welfare of the insects in the matter of food and ventilation, than are the obstinate and caste-enchained ryots of India, would at once adopt those modes of treatment which were pointed out and insisted upon by competent instructors. But on the other hand when we come to urge "the mild Hindoo" to adopt a better system than he has hitherto pursued, we shall at once be met by the declaration that his poverty and dislike of innovation will prevent his making any alteration; he cannot afford to cultivate the mulberry in any other manner than that which his respected forefathers pursued; giving the worms more food, and of a better quality would increase his expenses so much that he would be compelled to raise the price of the cocoons. To this the purchaser would object, and a system of "pull devil, pull baker," be introduced which would effectually keep all real improvement at a stand still. The native cultivator however, must not only alter the quality and quantity of the food, but he must be compelled to erect more suitable rearing sheds, free alike from the dirt, smoke, and malarious influences arising from neglect of free ventilation and the non-adoption of common sense sanitary principles. Dirt, to a poverty striken native is second nature, and you cannot wean him from it, nor from his determination to squeeze as much profit out of the worms as he can, at the very least expense to himself,—not considering in his blindness that the more he saves in the feeding and rearing, the less he gains on his cocoons! The Cottage system therefore, that is to say what is so considered in Europe, is the one of all others when applied to India the best calculated to insure a bad supply of cocoons; in short, it is the present Bengal system, and ought to be extinguished. If the quantity of silk cultivated in Bengal is to be increased, and the quality improved, it can only be done by restoring the worm through a better system of feeding to renewed health and vigour; this the ryots will never effect, and the sericulturist in Bengal must consequently do it for himself. But how, he may ask, am I to do so if the natives persist in thwarting me? Simply, I reply, by sending the native to Jericho until he comes to his senses, and in the meantime, as I have repeatedly pointed out, the European sericulturist must take the entire system of cultivation into his own hands; he must in short become in truth a practical cultivator himself, instead of remaining, as now, a mere purchaser of bad cocoons, or being compelled to shut up his filature; at present he has none other than "*Hobson's choice,*" bad cocoons or none at all! He will probably tell me that he can reel an excellent silk from these cheap cocoons, and doubtless this is true enough, but the real question is whether he gets as much silk and of as good a quality from these cocoons, as he would have done had they been more judiciously attended to, and here I answer for him that he certainly does not. Then why not have the best cocoons by putting his own shoulder to the wheel and forming a plantation from which he may derive *ripe* leaves containing in perfection in their juices the best material from which the purest silk gum can alone be secreted by the worm. The lands now occupied by the mulberry bushes in which the natives put such faith, should be thoroughly ploughed, manured and then replanted with young healthy trees or cuttings of the very best description procurable, taking due care that such trees are, if possible, *indigenous* in those districts of China, Japan or elsewhere, in which the monthly worms are themselves either indigenous or extensively cultivated, for by so doing you may fortunately apportion to the insects the very trees, or some of them, upon which they in the first instance existed. Then as to the rearing houses; they too should be solely under the control and supervision of the Capitalist himself with an intelligent European superintendent under him, the ryots being employed under his eye, in picking and bringing in the leaves, as frequently and in such quantities as the case requires; let there be no stinting, but see that the work is properly attended to, for a saving in the feeding will be a loss on the cocoon. By this method, the health of the worms would be improved and the cocoons become well stuffed with silk of a superior quality; ventilation, cleanliness, temperature all being properly attended to, the yield of silk in the hands of the sericulturist would in all probability be double what it now is. The greatest difficulty to contend against would no doubt arise from the dislike to introduce a new system. Yet this I am confident will be the only means of putting the present vicious system on a better and more remunerative footing. It may be said that it is advisable to "let well alone," but unfortunately the present hue and cry and stir at home for the extension and improvement of Bengal silk at once proclaims that there is very little that is good enough to be let alone. A radical change must be effected, for after all it simply comes to this, that if you wish to increase the quantity of silk, you will never be able to do so under the present faulty system of feeding and rearing; consequently you must either change it for a better, or be content to remain as you are at present. Let your efforts however, be confined to Bengal and Southern India, for if you attempt to introduce the monthly worms into the Upper Provinces, nothing but failure and loss of capital will be the result, and as you cannot with all your skill "make a silken purse out of a sow's ear, so neither can you force these worms to thrive in localities and climates where nature has decreed that they shall not thrive.

By the term—"extension of silk cultivation in India"—I apprehend is meant, a more general diffusion of the worms, a greater quantity of silk from a given number of worms, and greater attention in the reeling; if such be the case I warn the sericulturist against the diffusion of the montly worms beyond Bengal, for the reasons already given,—while with respect to the Boropdoloo, or *B. textor*, it should be at once removed from Bengal where it is said to be fast dying out, to a colder climate in some parts of the Subhimalaya where it could be profitably cultivated side by side with *Bombyx mori* from Cashmere.

It is an utter fallacy to suppose that the silkworm requires a climate free from moisture; it is the want of humidity in the climate of the upper Provinces that enfeebles the worm and makes it languid and limp, thus rendering it incapable of yielding a full crop of silk. This has been well proved this season (1869) at Mussooree, among the wild silkworms (B. Huttoni) for while last year this species was found in hundreds on every tree there is now from the great heat and want of rain and humidity, not one to be seen. The eggs of last Autumn still remain upon the trees, a few have hatched and the worms have been literally shrivelled up by want of rain and by the prevalence of scorching heat,—while other eggs are still unhatched in June and are waiting for the setting in of the periodical monsoon. If then the heat thus injuriously operates upon the *indigenous* worms in our climate, what must be its effect in those scorching districts which are subject to the furnace-like blast of the hot winds? Where the speculator possesses "more money than brains" the best possible way of equalising the two, will be to attempt silk cultivation with Chinese worms in the North Western Provinces of India! Taking it for granted, however, that the majority of our sericulturists are something superior to mere blind speculators acting on "the rule of thumb" and simply following their noses with nothing but the doctrine of chances to guide them, I think we may safely predict a rapidly approaching time when prejudice and red tape will be cast aside, and a new era be ushered in. The time for mere experiments has passed away; the mulberry worms have been introduced into districts where they had previously had no fair trial, and in every instance signal failure has been the result; we have now hard facts and experience before us as a guide and if we do not profit by what we have thus learnt there will be nothing but failure in the future.

Secondly, with regard to "the introduction of silkworms wherever the mulberry is capable of giving food to the worms,"—I view the doctrine simply as a piece of claptrap calculated only to spin out a speech and lure the sericulturist to destruction. Wherever the mulberry is found it is no doubt "capable of giving food to the silkworms"; this is a mere truism,—but does it follow as a natural consequence, that where the mulberry is capable of growing there the worms must necessarily thrive upon its leaves? The logic of the argument runs somewhat thus,—'John Bull is fond of Beef, and in a climate suited to his constitution, will thrive upon it,'—but it does not therefore follow that he will thrive upon it in a climate injurious to his constitution; it is a well known fact that the food of mankind varies in every climate of the world,—the coldest regions require the most nourishing and stimulating food, but in tropical climes that same nourishment would be productive only of disease. Man can exist in every climate, but as a species, he does not thrive equally well in all; and so is it with the mulberry tree; it will grow, but it does not therefore follow that in every clime it will yield the same quantity and quality of aliment; to grow is one thing but to thrive is quite another; the leaves will everywhere be "capable of giving food," because that consists of the fibrous portion of the leaf, but if those substances which go to the production of silk be wanting either wholly or in part, little or none will be furnished for the fabrication of the cocoon. I have already stated above that where the leaves are deficient in silk producing properties, the worms will require more frequent supplies, and that the rest of the insect being thus interrupted and greater labour imposed upon it, the effect must eventually be deterioration. To support my argument I invite the practical sericulturist to look round on nature that he may see with his own eyes how after feeding every animal seeks repose; why is this? simply because it is ordained that continued exercise after feeding impedes digestion! This was many years ago well proved by an experiment tried upon a brace of Greyhounds; both were well fed,—then one was chained up and left at home, while the other was taken to the field and coursed. When the coursing ceased both dogs were killed, and it was then found that the sleeping dog had nearly digested his food, while that of the other remained *in statu quo.*

Again, we know that every part of India will nourish mulberry trees, but at the same time we at present know positively nothing in regard to the quality of the leaves except that from the repeated failure of the worms wherever they have been introduced, we are entitled to infer that the quality of the nourishment afforded, together with the heat, are alike unsuited to the worms. Even with respect to the *indigenous* trees, their existence does not prove the districts in which they grow to be suitable to the *imported* worms; on the contrary, Nature herself by having placed no indigenous species upon such trees at once gives warning that she never intended them to exist there. In the Himalaya she has acted on another principle, having furnished the indigenous trees with a species peculiar to them and the climate in which they grow, by which means she has proclaimed these districts to be adapted to the production of silk, and backs the assertion by the further evidence derivable from the existence of *eleven* other species of the Bombycidæ nourished upon various indigenous trees. What plainer speaking man can desire I am at a loss to conceive. If then nature has placed indigenous species upon the indigenous trees of the Himalaya while she has placed none upon those of the lowland mulberry, are we not fully justified in declaring that as the Book of nature was intended to be man's earliest guide and primer in appropriating to himself the Wisdom of his Maker, so it must be mere wilful folly to attempt by artificial means to obtain results which Nature plainly tells us are contrary to her plans, and the Wisdom displayed around us. At the same time however, although she refuses to introduce the mulberry worms of other climes, she does not leave the lowland provinces a blank, but on the other hand points out their perfect suitableness for the cultivation of those other wild species which she has every where bountifully scattered over the length and breadth of this vast and generally neglected Empire.

These are points which probably none but a naturalist would take into serious consideration in the treatment of this important subject, and yet it is absolutely essential for the sericulturist to know how nature acts and what she wills should be, for it is only by the rational study of her works that he can ascertain how far she may feel inclined to assist him, and if he wilfully shuts his eyes to facts and determines to pursue an unnatural system of his own by acting in opposition to her *dictum*, he will only have himself to thank should his efforts eventually end in total failure. "Go to the ant, thou sluggard; consider her ways, and be wise." In the present instance let us go for wisdom to the mulberry feeding Bombyces, and we shall find them answering to our inquiries that 'Nature by not placing any of them upon the indigenous trees of the lowland provinces proclaims aloud that she does not consider their climates suitable to their constitution, and therefore located them in different latitudes and climates upon trees there previously provided for their nourishment; therefore be wise and profit by the warning and advice thus given by a Master Mind, rejecting the illogical doctrine that wherever the mulberry grows there too ought silkworms to exist and thrive; or if you will not be guided by such evidence as their non-existence in those provinces affords, at least let the frequent failures in the attempt to introduce them, arrest your steps in time to save you from an otherwise inevitable loss.'

I have no expectation that my croaking views will be more readily attended to now, than formerly, while yet I believe it to be my duty to my fellow men to speak out boldly what I consider to be the honest truth. "*Hinc illæ lachrymæ.*"

I may be asked what species of mulberry tree I would recommend for the rearing of the worms, and I would certainly reply that this must be regulated by the nature of the species under cultivation, and the climate in which they are situated. In Bengal where alone in India the monthly worms are capable of being cultivated with any prospect of success the trees selected should come from the districts from whence the worms themselves were originally procured, while the annuals of the north should be reared on the leaves of northern trees. I have tried at Mussooree the Phillipine mulberry *(M: multicaulis.)* the large leafed *Morus cucullata*, the Chinese *Morus Sinensis*, and several other species, and invariably found that the silk was both more abundant and of better quality when the worms were reared upon the leaves of *Morus Sinensis* and *Morus nigra* than upon any others; while worms fed upon the leaves of *M. multicaulis* and *M. cucullata* produced nothing but a thin flimsy web through which the pupa was distincty visible.

It is to be remarked however that this experiment was tried upon northern worms and with the trees growing in a northern climate, so that the advantages were all on the side of the northern species and against the southern trees. In Oudh however where the southern *M: cucullata* might be supposed to possess an advantage over the *M. Sinensis*, the very same results were observed, as my son, Mr. A. R. Hutton of the Oudh Commission, who conducted an experiment under the orders of that Government, informs me that when he first entered upon the experiment with *Bombyx Mori*, *B. textor* and *B. Sinensis* it was found with respect to the latter worm that it was in such a weakly condition as to be unable to guaw the epidermis of even so thin a leaf as that of *Morus cucullata*, and it was found necesary to chop the leaves very finely for them during the first stage when instead of eating the fibrous portions they contented themselves with the sap exuding from the edges. Placed upon the unchopped leaf they wandered about and died being unable to pierce it; in the following year he changed the leaf for that of *Morus Sinensis* and found that his worms had improved, and that in the third year they had improved still more. From this it was somewhat hastily inferred that if the experiment had been continued the worms would have annually improved until they had reached the Bengal standard when nothing more would be needed, and the experiment would have been success-ful. Unfortunately however when we look further into details we find that this inference was entirely a false one, there being in point of fact no real improvement in the worm at all except that it was healthier when fed upon the more solid leaf of *M. Sinensis* than upon those of the thin watery leaf of *M. cucullata;* moreover there was no improvement upon the worms of the first year, for these died off in such vast numbers as to render a fresh importation from Calcutta necessary, so that it was only annually commencing the same experiment *de novo!* To establish an improvement in the worm required that the worms of the first year should have perpetuated themselves and then gone on annually improving, and this they did not do; in short, the experiment never advanced at all but annually recommenced with the importation of fresh ones from Calcutta. The fact that the worms annually imported, throve better on *M Sinensis* than the first batch had done on *M. cucullata* is *à propos* to nothing, as it only shows that the worms thrive better upon good than upon bad food. Besides which it appears that the alleged improvement was entirely the exception, the majority of worms dying off and leaving a few good ones *to prove the rule* that *the climate was inimical* to the species! As to *B. mori* and *B textor* th[illegible] acknowledged to have been a failure

In conclusion then permit me to say one more word on the crossing of species Darwin has stated that if a plant's own pollen be brought on a brush it will invariably prove prepotent over that of a foreign species; that is to say, that nature rejects all crossing so long as a plant's own pollen is available.

Now if we apply this natural law to the Silkworm it will at once show why the progeny of two different species when crossed invariably, sooner or later, revert to their original state, or more commonly to that of the strongest species. We cross *B. fortunatus* upon *B. mori;* the moths produced have, so to speak, the blood of both species; but when they couple there is a struggle for the mastery between the two, each striving to cast out the other, and the blood of the stronger species will prove prepotent over that of the weaker, and consequently unless the latter be recrossed by its own species, it must by the law of Nature revert to an Annual. Here the stronger blood of *B. mori* in the male moth meeting with an equal portion of the same blood in the female proves prepotent over the two parts of the blood of the weaker *B. fortunatus* and casts it out by reverting to Annuals.

These two species at Mussooree, when the crossing is judiciously kept up, produce a very excellent silk of a golden colour, the cocoon being much larger than that of *B. fortunatus* of Bengal,—but when once the crossing ceases *B. mori* invariably reappears But it is time to stop for methinks I hear you cry—' *Ohe, jam satis* !'

THE GARDENER'S NOTE BOOK, No 11.

A few notes on the varieties of Caladium known in this Country; by SAMUEL JENNINGS, F. R. H. S.

For the convenience and information of Members who have received miscellaneous collections of Caladium bulbs, or have lost the names of their plants, I append the following memoranda which may assist them in identifying all the different species.

The distinguishing marks of the various descriptions of Caladium are *spots,* red, pink or white in clusters or scattered over the surface of the leaf, sometimes so large as to be almost blotches, at other times so small as to be quite nebulous in appearance—*patches* of colour mostly lighter green or yellow—and *veins* either white, green, or red with more or less of colour spreading itself from the centre vein over the surface of the leaf.

The leaves of Caladia are generally "heart shaped" but in some cases they are decidedly "hastate" or "spear shaped," longer and narrower than the former.

In the first season after introduction to this country, many varieties bearing different names are so similar in appearance as to be scarcely distinguishable; they should however be kept carefully apart and their distinctive features will be much more clearly developed in the second and following seasons, for example, C. Chantinii, C. albo maculatum C. Madam

Andrei, and C. fulgens, are almost identical in their first year, as are also, C. Brogmarti and C. bicolor major, and C. Wightii and C. Thibaultii.

The following varieties are in my collection and I believe they are all correctly named.

1. *Caladium albo maculatum.* Large heart shaped leaf, principal veins pale red, with slight shading of white on either side, spots, small and pure white, thickly covering the surface of the leaf between the veins and the edges.

2. *C. amabile.* Leaf, large, pale green, veins lighter green extending for about half an inch on either side of the mid-rib and principal veins and gradually blending into the ground colour of the leaf, a few white spots in groups, near the mid-rib.

3. *C. argyrites.* The smallest variety, leaves dark green, from 6 to 9 inches long, strongly blotched with chalky white; if well grown there will frequently be a margin of distinct white veins all round the edge of the leaf.

4. *C. argyrospilum.* Leaf. medium size, dark green, scantily spotted with small, irregular shaped white spots.

5. *C atropurpureum,* (black purple) The plant I have was received from Messrs Veitch and Sons only this year. I can in no way distinguish it at present from *C. Chantinii,* and certainly its characteristics as implied by its name are in no way discernable.

6 *C. Baraquinii.* Leaf large size, veins blood red; the colour covering nearly the whole of the leaf leaving a narrow border of green blending into the red with golden spots The stems are also deep red

7. *C. Bellemei.* Dark green hastate leaf, thickly covered with a most beautiful nebulæ of small white spots, blending with each other towards the centre, which is often of the most delicate rose tint.

8. *C. bicolor,* sometimes called, *A rum pictum.* A well known species, the first which was introduced into India, a moderate

sized bright green leaf with a red centre extending about half way towords the edge.

9. *C. bicolor major.* A fine variety of the above; the colour however is collected on either side of the mid-rib and principal veins.

10. *C. Brogniarti.* Distinguished from the above by a pale green shading on either side of the red mid-rib and veins.

11. *C. cœnarti.* Leaf large, light-green, veins bright red, a few groups of pale pink blotches in each division of the leaf which when well grown has a most beautiful metallic lustre or bloom similar to that upon a purple grape.

12. *C. Chantinii.* like *C. albo maculatum* without the white shading, the spots are larger and more irregular in shape.

13. *C. Chelsoni.* A very handsome variety; leaf large size and bright green, it is like *C. bicolor*, with large blotches of deep red, sparingly scattered over the surface of the leaf.

14. *C. fulgens*, like *C. Chantinii* but with a deep border of red on either side of mid-rib and principal veins.

15. *C. hæmatostigmum* Leaf large and very dark green. Stems black, a few groups of dark rose blotches scattered over the leaf.

16. *C. hastatum* Leaf medium size, light green, *hastate*, a few irregular white spots and blotches, all the smaller veins distinctly marked like network of dark green.

17. *C. Houletti.* Leaf large bright green, mid-rib and principal veins white, pencelling extending a short distance on either side, large irregular white spots over the whole surface of the leaf.

18. *C. lactatum* Like *C. hastatum*, the only difference being that the surface of the leaf has a milky appearance not unlike frosted silver.

19. *C. Madam Andrei* belongs to the *Chantinii* group, but in this case the red veins are more strongly marked and edged with pale green, and the spots are much larger and fewer.

20. *C. Madam Houlett.* Leaf large, dark green, spots even-

ly spread over the whole surface, medium size, irregular shape, pink colour.

21. *C. marmoratum.* Leaf small size, dark green, blotches very large, irregular shape and light green.

22. *C. mirabile.* Leaf medium size, dark green, mid-rib and veins light green, spot small, evenly scattered, chalky white.

23. *C Neumanii.* Leaf large size, light green, spots of different sizes evenly scattered all over the leaf, colour bright red.

24. *C. pictum.* Leaf large, dark green, texture thicker than any of the other varieties, blotches irregularly arranged over the surface, pale creamy yellow

25. *C picturatum.* Leaf small, hastate, mid-rib and two upper veins bright pink, extending on either side a short distance and forming a Y shape.

26 *C. pœcile.* Leaf large, dark green, centre bright pink, spots in groups and blotches of same colour; a handsome variety.

27. *C. rubicaule,* like *C. Cœnartii,* colour darker, stems red and there is no bloom on the leaf.

28. *C. rubromaculatum.* Leaf medium size, bright green, spots vermillion in groups, scattered over the surface.

29. *C. Schilleri.* Leaf medium size, bright green, mid-rib and side veins white, spot very minute, thickly clustered near the centre and extending evenly with a nebulous appearance about half to the edge.

30. *C. Ledeni.* Leaf large, dark green, mid-rib and veins red, side colour shading light green extending half way to the edge, spots in groups bright pink.

31. *C. Thibaultii.* First season here, appears to be a fine variety of *C. Wightii.*

32. *C. tricolorum.* Leaf medum size, dark green mid-rib and side pencelling light green, spots few and small, bright vermillion.

33. *C: Verschaffelti.* Leaf large, dark green, spots bright scarlet in groups, arranged in form of a horse shoe, the surface of the leaf has often a bright metallic lustre.

34. *C. violaceum.* A plain dark green leaf without any coloured spots, or marks. It has a raisin bloom surface.

35. *C. Wightii.* Leaf medium sized, dark green, spots some white and others scarlet, irregularly scattered over the surface.

THE GARDENER'S NOTE BOOK, NO. 12.

A list of Climbers grown in Calcutta and its vicinity, giving the colour of flower, mode of propagation &c.; by R. ERRINGTON *late Head Gardener of the Society.*

[The following list has been prepared by Mr. Errington to meet constant applications for information as respects the growth &c., of a large number of favorite climbing plants which are cultivated by Amateur Gardeners]

Names.	Colour.	Mode of Propagation.	Time required for propagation.	Season for layering.
Abutilon striatum,	Orange,	Cuttings,	1 to 2 months,	Early in Rains.
Allamanda Aubleti,	Yellow,	,,	,, ,, ,,	,, ,,
Arundina bambusæfolium,	Red and purple,	Division of roots,		March to June.
Allamanda Schotti,	Yellow,	Cuttings,	1 to 2 months,	Early in Rains.
*Amphilophium Mutisi,	Plum and yellow,	Layers only,	2 to 3 months,	,, ,,
*Argyreia splendens,	Rose,	Layers and Cuttings,	1 to 3 ,,	,, ,,
*,, cuneata,	Plum,	Do. Do.	1 to 3 ,,	,, ,,
*Aristolochia Braziliensis,	Crimson with col spot	Do. Do.	1 to 2 ,,	,, ,,
Asystasia Coromandaliana,	Bluish and purple,	Do. Do.	1 to 3 ,,	,, ,,
Asparagus racemosus,	White,	Seeds,	one month,	March to June.
*Banisteria laurifolia,	Yellow,	Layers,	2 to 5 months,	Early in Rains.
*Beaumontia grandiflora,	White,	Seeds & Cutts & layers	2 to 3 ,,	Cuttings and layers in Rains—Seeds [March to June.
*Bignonia crucigera,	Tawny,	Layers, ,,	1 to 3 ,,	Early in Rains.
*,, Chamberlaynii,	Yellow,	,, ,,	1 month only,	,, ,,
,, equinoctialis,	Orange and yellow,	Cuttings and layers,	1 ,,	,, ,,
*,, gracilis,	,,	,, ,,	1 ,, ,,	,, ,,
*,, incarnata,	Blue spotted,	,, ,,	1 ,, ,,	,, ,,
*,, venusta,	Yellow,	,, ,,	1 ,, ,,	,, ,,
,, grandiflora,	,,	,, ,,	1 ,, ,,	,, ,,
*Bougainvillea spectabilis,	Purple,	,, ,,	2 to 5	,, ,,
Cissus discolor,		,, ,,	1 to 2 months,	March to June.
*Clematis gouriana,	White,	Cuttings only,	1 to 2 ,,	Early in Rains.
,, flamula,	,,	,, and Layers,	1 to 3 ,,	,, ,,
Clerodendrum splendens,	Scarlet,	Cuttings only,	1 to 2 ,,	,, ,,
Clitorea plumerii,	Pink and white,	Seeds,	1 month only,	March to June.
,, ternatea,	Blue,	,,	1 ,, ,,	,, ,,
*Combretum purpureum,	Scarlet,	Cuttings and Layers,	1 to 4 months	Early in Rains.
*Conzea azurea,	Pale blue,	Layers only,	2 to 5 ,,	,, ,,
*Cryptostegia grandiflora,	Plum,	Seeds,	1 to 3 ,,	March to June

Names.	Colour.	Mode of Propagation.	Time required for propagation.	Season for layering.
Cordiospermum halicacabum,	White,	Cuttings,	1 month,	Early in Rains.
*Dalbergia scandens,	Whitish,	Seeds and Layers,	1 to 3 months,	,, ,,
*Echites caryophyllata,	White,	Cuttings and layers,	1 to 3 ,,	,, ,,
Gloriosa superba,	Scarlet,	By division,	1 to 2 ,,	Germinate during rains.
Hexacantris Mysorensis,	Yellowish,	Cuttings only,	1 to 2 ,,	Early in Rains.
*,, lutea,	Yellow,	,,	1 to 2 ,,	,, ,,
*Hoya carnosa,	Pink and whitish,	,,	1 to 2 ,,	,, ,,
,, Imperialis,		Leaves,	1 to 2 ,,	,, ,,
*Ipomea Leari,	Blue,	Layers,	1 to 2 ,,	,, ,,
*,, Horsefalli,	Purplish,	Cuttings,	1 to 2 ,,	,, ,,
*,, semperflorens,	Blue,	Seeds and layers,	1 to 2 ,,	,, ,,
*,, rubra cerulea,	,,	,, ,,	1 to 2 ,,	August to November
*Jasminum laurifolium,	White,	Cuttings and layers,	1 to 3 months,	Early in Rains.
*Lonicera brachypoda,	,,	,, ,,	1 to ,, ,,	,, ,,
*,, Japonica,	Yellow,	,, ,,	1 to ,, ,,	,, ,,
Manettia cordifolia,	Scarlet,	,, only,	1 to 2 ,,	,, ,,
Mandevillea suaveolens,	White,	,, and layers,	1 to 3 ,,	,, ,,
Maurandya Barclayana,	Purple,	,, and seeds,	1 to 2 ,,	October to November.
*Melodinus monogynus,	White,	Layers only,	1 to 2 ,,	Early in Rains.
*Murucuya ocellata,	Scarlet,	Cuttings,	1 to 3 ,,	,, ,,
*Parsonsia corymbosa,	,,	Layers,	3 to 5 ,,	,, ,,
*Passiflora Middletoniana,	Blue,	,, and Cuttings,	1 to 3 ,,	,, ,,
*,, quadrangularis,	,,	,, ,,	1 to 3 ,,	,, ,,
*,, laurifolia,	Blue white,	,, ,,	1 to 3 ,,	,, ,,
,, Mayani,	Green, ,,	,, ,,	1 to 3 ,,	,, ,,
*,, Gouteeri,	Blue,	,, ,,	1 to 3 ,,	,, ,,
*,, kermesina,	Crimson,	,, ,,	1 to 3 ,,	,, ,,
*,, cerulea, racemosa,	Blue crimson,	,, ,,	1 to 3 ,,	,, ,,
,, princeps,	Scarlet white,	,, ,,	1 to 3 ,,	,, ,,

*Passiflora alata,	Blue white,	Layers and cuttings,	1 to 3 months,	Early in Rains.
*Pergularia odoratissima,	Yellow,	,, ,,	1 to 3 ,,	,, ,,
*Petrea volubilis,	Blue,	,, ,,	2 to 3 ,,	,, ,,
*Porana paniculata,	Whitish,	,, ,,	1 to 3 ,,	,, ,,
*Poivria coccinea,	Scarlet,	Layers only,	3 to 5 ,,	,, ,,
Pentalinon suberectum,	Yellow,	,, and cuttings,	2 to 5 ,,	,, ,,
*Quisqualis glabra,	Pink white,	Cuttings only,		,, ,,
*Roupelia grata,	White,	,, ,,	1 to 2 months,	,, ,,
Stephanotis floribunda,	White,	,, ,,	1 to 2 ,,	,, ,,
*Thunbergia grandiflora,	Blackish,	,, ,,	1 to 3 ,,	,, ,,
*,, laurifolia,	Blue,	,, and seeds,	1 to 2 ,,	,, ,,
,, aurantiaca,	Orange,	Cuttings and seeds,	1 to 2 ,,	,, ,,
Thunbergia alba,	White,	,, ,,	1 to 2 ,,	,, ,,
Torenia Asiatica,	Purple,	,, only,	1 to 2 ,,	,, ,,
Tecoma jasminoides,	,, white,	,, ,,	1 to 2 ,,	,, ,,
*Unona lævigata,	Yellowish,	Layers only,	1 to 2 ,,	,, ,,
*Vitis quadrangularis,	Whitish,	Cuttings,	1 to 2 ,,	,, ,,
*Wisteria Sinensis,	Lilac,	Layers,	3 to 5 ,,	,, ,,

Those marked * are plants of a rampant growth and cover a large trellis.

I have given to Bougainvillea 2 to 5 months to layer but even this may not suffice, some take freely and quickly, others may occupy nearly 12 months, all depends on the wood which should be young but well matured—old wood requires much longer. The same remarks apply to *Poivrea.* In all layers and cuttings made during the rainy season, the best time to make is as soon as the young growth is ready, either for layers or cuttings—that is not the growth made during the rains but preceding. About the middle of the rains, wood may be found fit also, but as a rule the ealier the better for getting well established plants.

In layering in pots I found another pot placed on the layer and half filled with earth—and during dry weather filled with water daily,—is a very good plan as it keeps the layer constantly moist and firm.

The Orange groves of Shalla.—*By* C. BROWNLOW ESQ.

THE emporium of Chattuck on the Soorma river has been created by the Hill trade of a considerable portion of the frontage of the Khasia range. This trade is in limestone, oranges, potatos, India rubber and other minor articles. The drainage of this frontage discharges itself opposite Chattuck by two mouths in close proximity to each other. Limestone comes down from the Therria and Shalla quarries and is burnt at Chattuck; oranges from Shalla; potatos from Bolagunge which again is a mart for a large portion of the interior of the hills; potatos also come down from a very different direction *viz*, the country of the Mārām Khasias which lies west of Shalla; these Khasias also bring down India rubber. The potato market consists of a number of sheds specially devoted to this article.

The orange mart is on the Chattuck or south bank of the Soorma and directly opposite to the mouth of the Shalla river. No sheds are required here as the trade is confined to the cold weather months when there is little or no rain and all transactions take place in the open air. The oranges are counted out at night instead of in the day on account of the coolness, the sun would heat the fruit too much and if after such exposure it was thrown into heaps as it always is, a fermentation would be apt to be set up. The custom in selling the oranges is to count them out in "alees" of four each, of which 750 go to the "Sou" of 3000; when prices are mentioned among dealers this "Sou" is an understood term.

Rain is very injurious to the fruit, impairing its keeping properties, occasioning it when in bulk soon to mould and go bad. This keeping property is one of great importance as far as the Calcutta trade is concerned, and choiceness in the quality of the fruit unless it is compatible with that property must give way; unfortunately it so happens that the finest oranges are not those that keep best, and hence though there are parts of the hills in which a fine delicate thin skinned orange is grown, it is mostly for local consumption, and there is no inducement but rather the contrary, to the improvement of the species.

In conveying the oranges down to Calcutta, time is of course a most important consideration since a cargo of this nature deteriorates more rapidly, probably, than any other; for this reason double crews are employed who keep the boats going day and night; steam has not yet been thought of, but probably small boats of considerable power and light draught, would answer well; they should depend for their profits on quick runs and on saving the percentage which according to the present system goes bad and is considered an inevitable loss, and not on large cargoes which involve delay in getting together and shipping.

The natives never use sand, sawdust, or rice husk or anything else that I am aware of for interstratifying with the fruit, but I know of no other reason why they should not except the extra trouble it would occasion; wrapping up each separate orange in paper as is done with fine qualities of fruit brought from distances by sea to the European markets, is a refinement that would be perfectly unintelligible to the Bengali or Khasia mahajun.

People wishing to visit the orange groves by water should go to the orange ghat. Here, during the cold weather, the long narrow dugouts, poled by two Khasias, and laden with their golden freight, keep dropping in at intervals all day long. I have seen as many as thirty moored all together, whilst the men are on shore cooking under cover of a mat; under which shelter they also sleep. In the morning when the boats emptied of this load start back, one may be had for a rupee or two to put one down at the orange groves, from which the poonjee or village of Shalla is a pleasant walk. Soon after leaving the Soorma, the Bengali homesteads are left behind and we enter that chain of bheels, or swamps which front almost the whole length of the Khasia hills, and the features of which are pretty generally known to every traveller in Bengal, a low swampy monotonous flat covered densely with null and khāg and on higher ground with ekur; interspersed are also a small fig and a thorny asparaginous plant which twines up the stems of the grasses.

The wild dog rose must not be omitted, it is very characteristic of these parts and lines the banks in dark green masses, which show off by contrast the blossoms which are abundant, of a snowy white and single; they are however quite scentless. The canoe pushes its way among the reeds and floating grasses of the margin amidst a general silence of nature except when a bittern rises with its harsh croak—or the still more clamorous sârus crane "makes the air vocal" with its note of alarm. Divers are bobbing their heads about but are not to be induced to wait until they present a practicable mark; long before this they are off with a flutter and a splash, to settle further ahead and be again disturbed.

Sunset brings us to a sand bank and here we stop for the night; the Khasias soon have their dhans out and in a quarter of an hour a reed hut is run up, the bedding is unrolled and a large fire lighted with the surrounding rubbish. Next morning we are up early, having slept "like a top" and pursue our journey, which to-day is more interesting; we exchange the mud banks of yesterday for shingle beds along which the canoe grates and grinds and bumps in the shallows; the banks consist of the same shingle beneath, with alluvium above, and support a vegetation consisting no longer entirely of grasses but with forest trees intermixed: the soil is however still stiff, wet, too deeply inundated, and when so, not soon relinquished by the waters owing to the close proximity of the bheel which retards and backs up and prevents the waters getting away with sufficient readiness; the pitch of the river bed is also slight and the waters comparatively sluggish, except just here and there where we come to a rapid. There are no signs of cultivation or human habitations and it is apparent we have not yet reached the soil and situation appropriate for that most delicate and choice in its predilections of all the Citrus tribe—the Orange.

As we keep ascending we at last arrive at where the pitch or fall of the river has considerably increased and the rapids are in close succession; the surface soil also is no longer clayey but consists of sand of different degrees of coarseness, but generally finer the further from the margin. The Kunchun *(Bauhinia* sp:*)* is abundant, and during the cold season whitens the banks with its flowers; there is also the Chām *(Artocarpus Chaplasha)* the Horreesh *(an Acacia)* Pooma *(Meliaceæ)* the Doomoor, *(Ficus carica)* and various other figs and nettles. The shingle is readily permeable by the waters so that frequently the stream may be seen to lessen in volume owing to a portion of its waters being sopped up; and disappearing beneath, and amongst the pebbles, to reappear again a long way below. There is therefore in all probability a stratum of water underlying the whole of the shingle banks, for a long way underneath, the contents of which stratum are by flux and reflux kept in a constant state of change, air and moisture are thus supplied from beneath (as well as above) and this fact should not be lost sight of in endeavouring to account for the congeniality of the land for the cultivation of a succulent fruit like the orange ;—the periodical floodings it receives have no doubt also something to do with the fertility of the land and its power of producing crops of a highly saccharine fruit year after year, without change or diminution and without manuring.

With regard to the surface, the land is flat, having a slight slope away from the river, there are few points that rise above the general level, the uniformity of which is only broken by the channels and cross-channels of natural surface drainage. These depressions are wet and clayey and may be traced by the Ekur grass, and Tehra (a wild cardamum) that grow in them. It is scarcely necessary to say that the orange will not thrive in them and wherever in the groves they occur they are in consequence left uncleared. Here in one large connected piece of perhaps 1000 acres is the garden that supplies a great part of Eastern as well as Western Bengal with oranges ; I say perhaps 1000 acres, because the area under cultivation is not known to the Khasia proprietors themselves either in Bengali or in any other land measure, and I was obliged to guess at it by the distance walked. One may walk for a good hour or two, always under the shade of orange trees, without reaching the limits of cultivation ; and when, as in December and January, every tree is laden, no sight can be more enjoyable. I have been through Sorrento gardens, but this beats Sorrento, and the Neapolitan orange growers would find some difficulty in selecting out of their entire *piáno* a piece at all approaching the size of this. As for the difference in the quality of the fruit, the advocates of that barbarous mode of consuming an orange *viz.*, by terebration and suction, may have something to say for Italy, but for my part I prefer a fruit that skins and skins easily. Moreover, even an Italian sun is incapable of imparting that pure lusciousness and of combining the sweet, the tart and the bitter in the same just proportions as we find here.

Should one here be unable to desist amidst such abundance from using the hook of his stick (or other implement) for helping himself, he should make sure to catch the fruit deftly, and on no account should it be allowed to touch the ground; an orange bruised should be an orange refused. It is no longer the same thing when flabby and ecchymosed, it begins to pour out its juices before they can well be conveyed to their receptacle.

The Khasia Gardeners so far from objecting to such depredations persist in plying one with more fruit than he can possibly consume.

A few labourers were about, weeding, cutting cane and collecting all the dead trees into stocks for fire-wood, and there were Khasia boys here and there with pelletbows to drive away the crows.

At the time of my visit most of the compartments near the river had already been plucked, but on advancing further into the interior we came upon the pluckers at work; each of them has a ladder about 20 feet long of light bamboo, with rungs of a strong but light wood well bound to the laterals with cane; a coarse net bag held open at the mouth by a cane ring depends on his back by a strap passed over the right shoulder and chest, and into this he throws all the oranges as fast as he plucks them; and he avails himself of the same opportunity, before removing the ladder to a fresh part of the tree, to pluck off all dead branches, moss, and parasites. A dhau sticks in his belt with which he occasionally chops off a dead or cankered branch, or cuts out a bunch of the bandha parasite. This parasite which infests the orange, tea and in fact all trees more or less, is very noxious and exhausting, it drives its roots into both bark and wood and occasions nodes in the branches and a general sickliness. The orange trees receive no other handling than the above; they are never systematically pruned or thinned and are allowed to retain just what fruit they set, and yet the crop turns out wanting neither in size, flavour, nor abundance. Contrast with this the elaborate summer and winter pruning of the French gardens, and the systematic cultivation and manuring of the Genoese, and yet with all their labour they produce a fruit inferior in quality and beyond all measure dearer in price than that produced by the comparatively thriftless and indolent Khasia; this is only another instance added to the many, of the easy terms, (too easy for the encouragement of habits of industry) on which, in the tropics, nature grants to man not only sustenance but luxuries.

The compartments above referred to belong each to a definite proprietor, and supposing him to prefer selling his oranges on the spot instead of taking them to Chattuck himself, where he would get a somewhat higher price, the mode of procedure is as follows. A Bengali dealer visits the compartment with the proprietor and an estimate is formed of the quantity of fruit it contains, on this an advance is made, and the pluckers are then and not till then engaged. The fruit being plucked the dealer brings his own men and carries it away. The pluckers were at the time of my visit charging a rupee a day.

The dealers' boats have the choice of two landing places, an upper and a lower, and they carry the fruit down in banghy baskets with elastic poles, a by no means unnecessary precaution. The whole of this huge plantation is marked and parcelled out with the greatest care, and every proprietor knows exactly how much is his; the marks used are clumps of the large Gulla cane planted at short intervals, or sometimes a row of betel palms or a mane of Ooloo grass left uncut.

These cane clumps are of quite as much use as thatching material, every house in Shalla being roofed with it; and the betel palms are grown here not so much for the nuts as to afford scantling rafters, posts and planks. The canes are not allowed to climb or they would be too much in the way, but are kept pruned down to a single leaf.

There is no regularity in the disposition of the orange trees which seems a pity, because, had they been laid out in rows, the general appearance of the plantation would be much improved. Whatever other fault may be found, want of care in filling up vacancies is certainly not one, and many tea-planters might take a lesson on this point.

In the first nurseries the seed is sown in January and February, thickly in troughs or boxes or whatever comes handy; I have seen an old canoe used for this purpose, but preferably on raised *Muchans* or platforms of bamboo matting, well supported beneath by slabs of betel palm; on this about 6 inches of soil is laid. The object of raising the nursery, which is never very large, is to keep it out of the reach of the pigs; nets are also thrown over to keep off rats and squirrels. These nurseries are often placed, not at the groves, but at the poonjee where they can be watered and well looked after until they get through their first few leaves, before which they are very delicate.* When the plants are to be pricked out, which is done during the ensuing rains, the advantage of keeping them off the ground appears in the roots being less straggly, and when the nursery is taken to pieces they can be shaken out of the loose and finely pulverized earth with absolutely no breakage. They are not yet however placed out where they are ultimately to stand and are transferred to another nursery, this time in the garden where they have more room given them ; the distances in this second nursery are not so great, but that the plants begin to check each other in a year ; however, check or no check, they are allowed no second transplantation unless a final one out to where they are to stand as trees The Khasia cultivation seems faulty in as much as they give only one weeding in the year and never any hoeing, the only parts that are weeded oftener is where the transplants are, which would otherwise be hurt by the grass over topping them, but it seems unable to do any positive harm to the large trees which is no doubt owing to the shade which prevents the grass from acquiring rankness and luxuriance and keeps it thin and meagre. In Kartick (October) the entire year's growth of weeds is cleared off, and as things lose their vigour of growth about this time and do not acquire it again fully before April, the plantation remains clear and neat if not cultivated for 6 months of the year.

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* The insect depredators to which young plants of both orange and citron are liable are 1st the grub of a butterfly, the eggs (the first generation) of which are deposited on young plants and the new growths of old ones and hatched in May. The egg is small, yellow and translucent and may readily be seen on the leaf; these must be picked off the very young plants. 2nd a nocturnal beetle which rings (but never cuts off) the new shoots, and lays an egg in the alburnum; the grub works back towards the main stem hollowing out the pith, and of course all the part above the ring dies. 3rd an insect which glazes over and leaves a convoluted trail all over the upperside of the leaf which causes it to curl and crumple up. 4th Aphides and their attendant

Parts of the plantation were not without traces of fires, the trees presenting the appearance of having at some former time been scorched, and the bark on one side killed, the wood then of course rots away until the decay is arrested by the vitality of the bark on the other side, and thus there is produced a sort of half tree with a stem more or less flat. I was assured they were not wanting in productiveness. Such accidents might be expected where the weeding is deferred so late, as an accidental delay of a few days would render

ants ; but these seem more a consequence than a cause of unhealthiness, as also are spiders making their webs among the leaves.

the standing weeds dry enough for fire to sweep through them. There are in the groves trees of a considerable age that have lived out at least 2 generations of men, and these old trees are great fruit bearers and are valued accordingly;—some of them yield 1000 oranges. Whatever may be their age they never grow to a greater girth than about 3 feet, or to a greater height than about 20. Should a tree of this age fall over, as they sometimes do, the Khasias who seldom take trouble over any thing will exert themselves to raise it and stay it with a live prop; small trees are allowed to lie, until they send up branches near the root which in time take the place of the prostrate stem. Trees frequently get sickly and gradually perish without any assignable cause, before reaching maturity, as well as after, and from the quantity of dead trunks stacked for firewood, the rate of mortality seemed high.

Of the power of Lemon, Citron, and Shaddock stocks, and the saving in time effected by using them, these cultivators have not the remotest conception, and the processes of grafting and budding are quite beyond their horticultural ken. The Khasias are not however such thorough paced conservatives as the Bengalis and would no doubt readily adopt these improvements if they were brought before them and explained to the most intelligent among them. The Society would be conferring a great benefit on the Khasias and the cause of orange culture, if they were to cause a batch of budded stocks to be forwarded through the groves with directions to Li Hăt, the head-man of the village, to have them planted and carefully supervised; the Khasias would soon detect the difference of growth between them and their own seedling plants.

Every thing relating to horticulture is in these parts sadly neglected, the fruit trees, especially the mangoes, are little better than wild; and many valuable sorts, such as the Litchi and long plum utterly unknown; not that the natives do not appreciate good fruit trees but because they cannot get them.

A single nursery for Eastern Bengal, under the superintendence of an able native gardener, and from which choice and new varieties could be disseminated, would be a great benefit to the district. The Chowdrys and Zemindars would soon possess themselves of them, and then their general diffusion among the poorer classes would only be a question of time.

As I was strolling through the plantation a string of Khasia women passed laden with wind falls. All the fruit which becomes so detatched is gathered every morning, peeled and given to the pigs and dogs, and it is not a little remarkable to see how the dogs have come by habit to relish them; the sight of a frugivorous carnivore would no doubt be a gratifying one to Mr. Darwin and his disciples.

The enemies that have to be contended with, at the time the crop is ripe, are numerous, and consist of crows, parrots, hornbills and monkeys; the monkeys which are of the common red sort, are especially impudent and destructive and go about in large troops. In the precincts we came upon one of these troops, who were only waiting for a favourable opportunity to make a raid; the leader was an old veteran, very bushy as to his whiskers and red as to his callosities, who had taken up his post on the top of a high and isolated betel palm; he was far too astute and wary to allow himself to be circumvented in such a position and accordingly, at the first glimpse of our party, he slid down with a velocity, modified only by friction, which occasioned sundry stoppages in his descent apparently for the purpose of giving his hands and feet, (?) time to cool: as for the rest of the party they vanished into the back ground of brush wood and trees, inaudibly and imperceptibly, with not even the crackling of a twig to show their whereabouts.

The orange is not the only Citrus cultivated in these groves; there are also the Shaddock (sokowit,) the Citron, sour Orange and Limes and Lemons of several varieties; all scattered about promiscuously and planted without any regard to order or regularity. The Khasias are very fond of the sour orange and eat it with salt. There are also jack and mango trees which have I suspect originated more by the negative process of refraining from cutting them down when inadvertently sown, than by any actual trouble taken to propagate them. These trees, as is the case all over these parts, are never tended in the least, and are generally infested with parasites; the mango trees especially abound with beautiful parasites and orchids and quantities of them might be collected from them alone.

Although the main orange plantation is on the left bank ascending there are also a considerable number of trees planted on the right bank, but though exactly opposite, and to all appearance of the same sort of land, the trees are found not to thrive so well on it and they are accordingly in a minority, and the land is planted chiefly with the Betel palm, Jack and Mango, interspersed with clumps of the universal gulla cane. This piece of land forms a wedge interposed between the Shalla river and one of its branches, it is inundated to a depth of 4 to 6 feet and the mosquitoes are complained of as very troublesome. This piece is weeded and tended with less care than that opposite. That formidable stinger, the large leafed nettle (chittra) was one of the most abundant weeds which ripened its berries, which are small, round and glistering white. Notwithstanding its virulence I was assured the Assamese ate largely of its tender tops as a *sāg*. I have already alluded to the fact of the lands hereabout being subject to inundations; these take place not once but several times in the course of the rains, the water however never stands on the land more than a few hours; the rubbish left among the branches indicated in parts along the margin a height of six feet, and towards the interior I was told it varied from that to the height of the knee. The houses of the watchmen and other people who live on the garden are with a view to this contingency raised off the ground, being suoported on strong Jackwood and Toon posts driven in deep; a log with steps cut in it, serves as a stair case to the first platform or flat which only occupies a portion of the front part of the house; from this another similar log leads up to the house proper which is a good 15 feet above ground level; the pigs, dogs, fowls, and goats take refuge during the floods on the lower platform.

The Bogapani and in fact all the tributaries which make up the Shalla river, have very rainy basins, and are subject to very sudden and considerable fluctuations of level. On one occasion the Government iron suspension bridge accross the Bogapani, was carried away so completely that nothing was left of the structure but one of the standards jammed between two boulders. I was informed at Shalla that the lowermost tier of houses was not even now considered safe from inundation, and on a former memorable occasion no less than forty houses were swept away and destroyed. The inundations are not however like what they are out in the plains where when the water once rises it does not subside for days and even weeks: here the river has a large bheel to diffuse itself into, and the river bed being highly inclined, the water is not impeded to any great extent by back-up, and discharges itself at a rate depending more on the width of the gorge it passes through on its exit from the hills.

Limestone first appears a short way above the orange gardens and first below Shalla poonjee, and thence forward to a considerable distance beyond the poonjee the left bank consists of its dark gray, rugged and fissured cliffs. The river, which where its course lies in sandstone and alluvium, nowhere varies greatly in depth, has here scooped or dissolved out an excavation so considerable as to give its water quite the blue appearance of the ocean. Scarcely inferior in attractiveness to the orange groves themselves is this beautiful blue reach of the river, over hung by lofty bluffs, with the dug outs skimming on the surface of the crystal clear water. There are myriads of fish glinting beneath, and awaiting the fly as yet undevised which is to effect their capture, which all the ingenuity of the Khasia is unable to do; in these deep pools fish of a yard in length are numerous, and the Mahasole revels in happy immunity from Isaac Walton's art.

Shalla village is planted on a steep slope of 45° extending from the water's edge upwards to a height of six or eight hundred feet, and looking not unlike a congeries of bonnets, stuck all over the hill; what gives the houses this appearance is the high pitched roof, and the almost circular arch of the verandah eaves. The houses are all built with one end touching the hill and the other at some height from it supported either on posts or rubble walls; the roofs are universally thatched with cane leaf. The preparing of the leaves is the work of the women and is managed as follows;—the thorns being stripped from the midrib which is about 6 feet in length all the leaflets are turned to one side, 5 or 6 of the fringes so formed are placed with the fringes in the same plane and the midribs also and the latter are then bound together firmly with a few ties at intervals; this forms a course of thatching and it is obvious that the stiffness of the united midribs enables "rooas" or rafters to be dispensed with and makes only longitudinals necessary. The upper houses have cisterns cut in the adjoining rock to catch rain water the fetching of which from the river is very laborious.

The village consists of upwards of 1000 houses each of which has a stake greater or less in the orange grove, several of the "Dulloys" or head-men have houses of brick and mortar.

Dugouts in use for carrying down the oranges are manufactured at Shalla in considerable numbers out of Chām, Toon and other varieties; the Khasia carpenters are very skilful at this sort of work; the only tools they use are an adzegouge, a hatchet, and a chisel with a long but light bamboo handle to it; the grasp of this tool when at work is close to the cutting edge, and the handle prevents it from digging into the wood so that it answers somewhat to our plane.

The Shalla village affords an instance of a hill community, depending entirely upon the proceeds of permanent plantations, this of course implies a fixity of abode, which is the first and most essential condition in the progress towards civilization, and the Khasias are probably the only hill tribes of this frontier, who can be said to answer to this description. They are about conterminous with the Sylhet facing, and it is along this facing alone and the valleys and slopes which descend into the plains, that permanent plantations of Orange, Jack, Betel palm and Pine-apple, are to be found, together with villages also of a permanent character and yearly improving. To the east-wards and in Cachar, numerous valleys also open out all of which are as thickly peopled by tribes of Kookees, Cacharees, and Oragas, but these strive for nothing more than mere subsistence; their cultivation extends to annuals only, and they never plant a permanent tree if they can help it; they also think nothing of shifting their poonjees in which a brick and mortar-house (nothing unusual with the Khasias) would indeed be a phenomenon.

Taking one of the numerous dug-outs moored along the sands of the village, I was soon paddled up to Phalli bazaar a point about half a mile up the stream. There was no semblance of shelter but the people carried on their transactions and amongst the huge boulders in the best way they could. There was a levy of Khasia damsels each of whom sat beside her basket or net of oranges, waiting her turn to be served by the imperturbable Mussulman boatmen who were giving out rice and fish in exchange for the oranges. This bazaar is during the orange season held daily, and large quantities of fruit are purchased mostly by barter; the whole of this fruit is of inferior quality (as far as its keeping properties are concerned) not that it is of a bad sort, much of it being thin skinned, small and of exquisite sweetness and flavour, but the mere carriage and the inevitable jolting and pressure it sustains in the basket ensures its being more or less bruised, hence it will not keep and has to be sold quickly and locally. The price at the ghat when I was there, was six Rs. per "Sou" being 4 Rs. less than the Shalla oranges at the groves, and yet in the case of the Phalli oranges six Rs. includes the labour of cultivation as well as carriage at the rate of ten men to a "Sou." A Khasia reckons his labour worth 8 annas per day and as only half his day must be reckoned, the remaining half or return journey being with victuals, it would appear the oranges might be sold at the poonjees at the rate of about 15 for a pice. Sugarcane juice is not cheaper. I tried to convince one of the vendors that it might be worth his while to convert his oranges into sugar or spirits and employ one man instead of ten to carry the produce to market, but it was of no use, such an extravagant view of the subject had never been presented to him and I left him unconvinced.

A European stationed further up the valley could doubtless draw to himself all this trade and procure oranges cheap enough to make wine with, as the Khasias would gladly sell them at inferior rates to the nearest post in order to save themselves carriage.

The Phalli oranges, are brought down the lateral valleys that are branches of the Shalla valley and among others from the following poonjees, Nong, Kraw, Nong-war, Nong-ba, Mostock, Nong-thry. Mostock is immediately above Shalla at about 1,000 feet elevation; I got some very good oranges here at 8 for the pice.

From some of these poonjees as well as from the Mhowmloo valley oranges are carried up to Cherra poonjee, where when in season they sell at 5 to 8 for a pice and are of a delicious thin skinned variety. At Cherra oranges may be had a month and more after they have been out of season; these oranges, which are much relished by some, and sell sometimes at a pice a piece, are procured by inspissating the juices until they are so concentrated that the fruit has no tendency to ferment, for this purpose the Khasias place them out on the *Muchans* of their houses, exposed to the wind, and turn them over frequently. Probably the same effect would be produced by allowing them to hang on the tree, like the 2 and 3 year old oranges so much in demand in Italy by those connoisseurs who can afford to pay for them, on account of their subacid sweetness and flavour; but in this country the violence of the storms of March and April would be against it.

Shingle beds, similar to that on which the Shalla plantation is formed, are common all along the front of the main range, they lie mostly opposite and adjacent to the mouths of the valleys at which points they attain their greatest development. The materials of which they are composed are those which show in their respective valleys, as granite and limestone in those of the Shalla, but none in those of the Goomrah Jatinga, and Layrang, where these rocks are absent, whilst sandstones and clay slates are the materials of which both the boulders and the adjacent hills consist.

It is characteristic of these beds, that they all slope from the main range (from the spurs of which they originate) downwards towards the plains. Hence where seen at whatever distance out on the plains and at whatever elevation above them, it may be presumed that that elevation will increase according to the distance traversed in the direction of the main range.

Were we to see the beds in their original integrity they would no doubt present the appearance of wide continuous flats joining on to the flanks of the main range, at various heights up to three hundred feet, and gradually dipping down towards the plains and under the alluvium to a much greater distance than they can at present be traced.

This original integrity however no longer exists, and the beds both older and newer, have been much cut up by lines of drainage as well as diminished in area by the encroachments of alluvium. Frequently the merest vestiges appear on the flanks of the main range, which can only by their height (allowing for slope) and composition, be judged to belong to some fragment opposite them but quite cut off from them at a greater or less distance out in the plains; occasionally the remnants of the beds will present the appearance of single hills or ranges of hills and even mere isolated hummocks rising out of the plain.

By whatever agency the soil may have been deposited on the beds, the deposition would seem to have been favoured by the flatness and unbrokenness of the land, for though the soil varies considerably in thickness, it may be observed to be most abundant and uniform in such situations; but where the land is no longer unbroken, but has undergone breaching and scouring, as it seems to have done in the process of formation of the isolated hills and ranges above referred to, these hills, both tops and flanks, will be found to be poorly furnished with soil, and in many places to consist of bare pebbles. Under these circumstances this formation from being one of the best for purposes of cultivation proves one of the worst: the pebbles at the surface prevent division of roots and, owing to their size and hardness, the operations of tillage can be but imperfectly performed; there being also no soil to retain the moisture it passes away to the detriment of vegetation with the same facility with which it percolates beneath to its benefit, a property to which I have already alluded in the Shalla beds; there also seems no tendency towards the formation of new soil as the pebbles owing to their hardness and smoothness are not affected by atmospheric causes, which produce disintegration more or less rapid in the rocks of which other low hill ranges in the district are composed, and which therefore, if originally unfurnished with a soil can in time form one In such localities neither the orange, nor tea nor any thing else will thrive, instances of their unfitness for tea may be seen in portions of the garden of Nutwanpore in Cachar and Thoobang in Sylhet —where, on the contrary, the land is flat and the soil consequently plentiful no lands can be better suited for the growth of oranges, tea and in fact all crops that love an open soil * The finest tea plantations in Chachar though not the largest are to be found on such lands, it is only necessary to mention Doloo and Kalinuggur on the shingle beds of the Jatinga Jarooltollah on those of the Arang and Kalline Cherra and Goomrah on those of the Goomrah

Of these the Doloo and Kalinuggur flat is the most considerable as is the Jatinga amongst the rivers, though it is not of the dead flat, undeviating character of an alluvial plain, it nevertheless possesses far greater uniformity than is generally met with in upland tracts the general level being only disturbed by a gentle rise from where it emerges from the alluvium to where it attains a height of 150 feet, more or less, above the plains, and by the depressions of natural surface drainage neither being so considerable as to prevent the existence on its surface of marshes in which, at a height of some scores of feet above the plains and inundation mark, reeds and other aquatic plants are to be found

The Doloo flat may be traced fragmentarily, both super and subter, alluvially as far as Boglah ghat a distance of 20 miles from the main range, and what is probably a portion of it appears in a river section at Silchar at about the same distance off, at 20 feet below the surface the pebbles

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* The Khasias raise excellent crops of Indian corn, millet, and potatos, on the inundatable shingle lands of the Therria river close under the Khasia Hills at the point where the road to Cherra poonjee strikes them

much diminished in size; the shingles of the smaller rivers disappear altogether at considerably less distances.

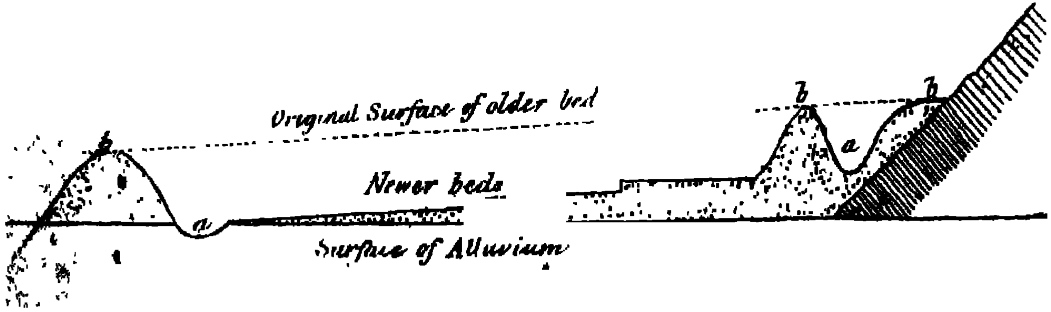
Tea Planters are well aware of the value of this sort of land and there is not much of it now remaining in the district that is not taken up, unless one goes some way up the valleys, and in Sylhet little can be had but what must be bought out from Khasia rajahs or villages or where far out on the plains from Bengali Zemindars.

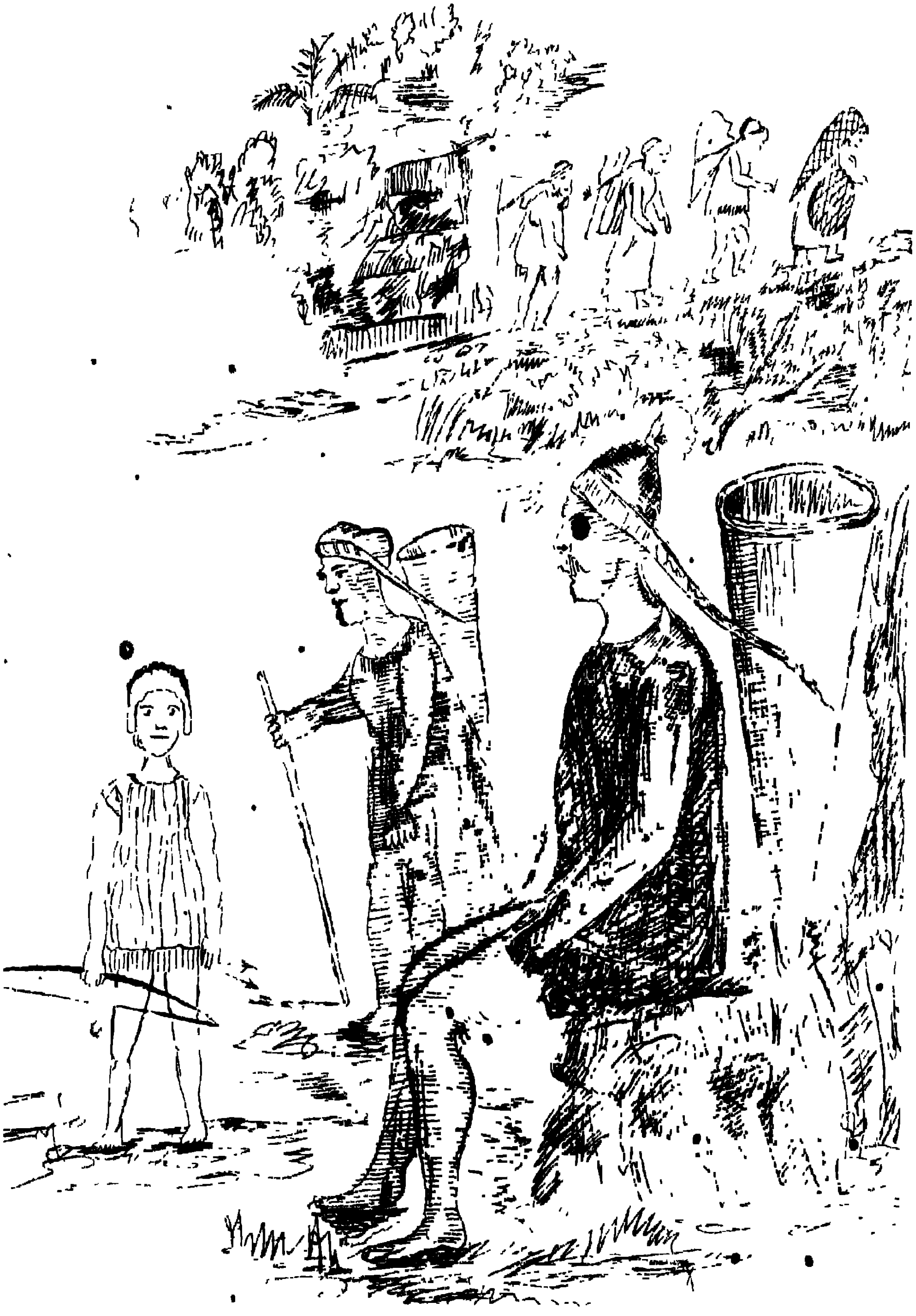
Shingle beds have been noticed at various points along the Himalayan frontage and even so far to the west as Jilalabad, by Irwin "(Report on subjects connected with Afghanistan, Asiatic Society's Journal No. 118, 1841") where he calls them glacis slopes and finds the same difficulty that occurs to one here in Cachar. In accounting for their formation by the sole and unaided action of the river he says "the rolled "pebbles are not limited even to the most extensive allow-"able sphere of action of the rush of the waters of the Jila-"labad basin but form a well developed belt or glacis slope "all round the bases of the boundaries of the valley."

Stewart notices them in his account of the Bijnour forests, (Agri. & Hort. Society's Journal Vol. XIII part 3;) Hooker in Sikkhim and Austen in Bootan.

Stewart notices that "these shingle beds extend furthest along the line of the rivers" which, as has been seen, is consonant with fact in Cachar; he also alludes to their great depth as ascertained by wells, although unfortunately for the Geologist no body digs nor has any occasion to dig wells in Cachar. The same conclusion may be arrived at from occasional deep sections, and in point of fact this material would seem to be the "dunnage" with which a large portion of the valley has been filled. The terracing noticed by Hooker in Sikkhim is very marked in Cachar, and in many places it seems as if an older bed had been cut up, and out of its materials a succession of lower terraces or steps formed, (I have seen as many as four), leading down to the plains, and mingling with them insensibly as shown in the figure below where the dotted portion is the shingle reposing against stratified rock—*a*, *a*, are water-courses; the hills (*b*, *b*, *b*,) are the relics left out of the ruin and dismemberment of the older bed and it is these that are so inappropriate for purposes of cultivation.

As to the incompetency of rivers unaided to perform the task of spreading out these masses of talus and the necessity of calling in an auxiliary force Dr. Stewart observes "any " geological theory involving the existence of an immense " ocean, covering in all probability, at least great part of the " Gangetic plain, at a time anterior to the plain itself as well " as the mountains to the north of it having attained their " present altitude, which will account for the formation of " the talus outside the Siwaliks, will equally explain the ex- " istence of the gravel beds in the Doons within them,"—and one might add by a slight generalization other taluses at other points along the range. None of our Geologists so far as I am aware have taken up the subject of these beds as a specialty, and any information regarding them must be gathered from scattered and casual allusions. Messrs. Austin and Medlicott have however recently visited the district, and since they could not fail to be impressed with a feature of such prominence it is not unreasonable to hope that some remarks on the subject from their pens may soon be forthcoming, which had they appeared before would have superseded the necessity of any discussion of it (imperfect as it must necessarily be) in this paper.





Khasia Orange Carriers.

Analysis of soil from the Orange groves of Shalla—*By* DAVID WALDIE ESQ., F. C. S.

BARNAGORE CHEMICAL WORKS:
21st August 1869.

A. H. BLECHYNDEN ESQ.,
Secy. Agri. Hort. Society.

Dear Sir,—The following is the result of my analysis of the sample of soil submitted to me for that purpose which you informed me had been sent by Mr. Brownlow from the Orange groves of Shalla.

Of the sample received 100 parts dried at 212° F. 97.27
or 102.8 as received equal to dry 100.

Soil dried at 212° F

Alumina...	6·09
Peroxide of Iron	4·93
Lime	·19
Magnesia	·13
Alkalies (by difference) and loss	·80
Silica soluble	·15
These dissolved by Hydrochloric acid..	12·29
Alumina chiefly with a little oxide of iron and a little lime	3·49
Dissolved by heating with sulphuric acid.	
Organic matter and combined water lost by burning...	5·66
Silica and Quartz	78·56
	100

It will be observed that this is a very siliceous soil, proceeding from the decomposition of siliceous rocks alone. It contains no carbonate of lime, and is a very open and porous soil,

Mode of extracting the oil from the Mowah seed (Bassia latifolia) as practised by the Ryots of the Zillah of Huzareebug. Communicated by MR. CLAUDE DUMAINE.

FROM the latter end of April and during the whole of May the natives are busy collecting the seeds from the Mowah trees. Sometimes they pick them up but mostly they break them with a long bamboo at the end of which there is a hook. This latter system is very injurious to the trees and naturally checks the growth of the tree and less oil is extracted from it.

When the seeds are covered with a thick green skin the average of seed is from two to three together; the natives in that state call them *koonree.* The skin is taken off by hitting with a stone while resting on another. The thick skin is eaten by the lower class of natives in different ways, and often they are glad to take the trouble of picking it up and separating it from the seed merely to get it. It is said to be very injurious to cattle of all kinds; it causes them generally to lose all strength.

When the seeds, are like the seed of the Litchee but bigger (the natives call them *Dorra* or *Dorree;*) they are put in water and after being allowed to soak for 24 hours the outward skin is taken off and thrown away. The inside of the seed is then separated into two and termed *Dhall;* it is dried in the sun until quite brittle and stored away.

When oil is required the said *Dhall* is pounded as fine as it can be in the *Dhankee* and termed *Choona.* The grass I mean the one with which the natives make string *("Sabaaj")* is placed in all directions so as to form a kind of a plate and one and half cutcha seer of that dhall is put on it; the edges are taken up and it is tied with the bark of the creeper called "Mowlan;" when the bark is extracted from the wood it is called *chop,* two balls of equal quantity are then made and tied as closely as possible. An ordinary fire-place is made called by the natives *Choola* by digging into the ground over which a good handy is put full of water, the mouth of which is rather broad, and over it comes another, but a hole is made at the bottom of the latter. Mud is put all round the handy where they join to prevent the steam from going out by that hole. At the beginning the fire is lit with wood but afterwards the oil cake is used instead of it.

Now then the two balls above described are put one on the top of the other in the top handy and covered with green leaves until such time as the water is brought to the highest boiling point.

Now these two balls are taken out and put one on the top of the other on the press, which I am going to describe, a piece of wood 18 to 20 inches long by a foot broad and 9 inches thick. One end of it is rounded and the one from which the oil falls is pointed.

The press is called *Chaipee.* In the centre of that wood a circle is made A, round which a rim is sunk B, which leads to C, where a green leaf is put over which the oil runs before falling in the pan put to receive it at C. The two above balls are put on the centre of the press A, over which a large broad stone is put to cover them, and then a long pole is introduced in the tree which has a hole made into it for the purpose of resting over the stone; it is used on the lever principle until all the oil is extracted. A number of men sit on the wood which is generally 15 to 16 feet long, the oil runs out very freely; when all is extracted the cakes are taken out flat, from between the grass, which I send merely to show how it is put up. The flat oil-cake being taken out the same operation is again performed; they have a tanned skin on which the *Choona* as they term it is put and tied on. Two men are kept only for weighing the stuff and tying the parcels, while another person, who is generally a woman, is kept at the fire and another woman near the oil, each one has his own work and attends to it and nothing else, the other people are there to lift up the stone and press down the wood; the woman who attends the oil when falling sees that the cakes are put straight on the press. The average quantity is from one to one and ¼ seer of oil to every three seers of Choona (pounded seed.)

The oil which is called *Koonree ka tail* is some times used by the natives for cooking purposes, but in that case the oil is extracted in the ordinary way in the *Kolloo*, but that extracted as above described is used for burning purposes and often rubbed on their bodies and they say it is very cooling. The colour is as you will see yellow and gets congealed like cocoanut oil and has the very appearance of true cow's ghee, in fact it is very often mixed and sold with the ghee and only can be detected by the strong smell which is partly done away with by cooking. The oil cake, although useful, is not much cared for by the natives. The following is all I have been able to find out regarding its use.

During the rainy season generally the natives make a small fire in their house on the top of which this oil cake is placed, the smoke has a very strong intoxicating smell and the ryots close the doors of their house so that all the smoke remains in. All kinds of insects, rats, snakes &c., which are unable to run out of the house are found dead. I have tried smoking a house without the oil cake but in the ordinary way but without success.

A small portion of the oil cake if thrown in the water will cause fish to float up, if thrown in small quantities it only intoxicates them, but in large quantity, say an ordinary cake, the size of a quarter plate, they will all be found dead.

It is well known and most valuable for curing the lick of the spider; pieces of it the size of an eight anna piece are thrown in the fire and when inflamed are precipitated in a basin of water over which the affected part is exposed covered with a towel to prevent the vapour from escaping; this performed two or three times cures the sore entirely.

I have tried it as manure but found no good from it in any way.

The price of the oil is from 2½ to 3 annas a puckee, that is a Calcutta seer, and as for the oil cake it has no value whatever in this part of the country. The only use I can see for the oil is making candles, coarse soap and burning.

I doubt very much if it could he palatable although it is used for cooking purposes by many natives. I should say if well clarified it would answer for lubricating purposes as it burns clear and makes very little smoke. I could not say exactly if the quantity procurable would be large enough to make a trade of it, but I should say 100 to 200 maunds could easily be procured from the surrounding villages, by sending men round to collect and attending all the markets held here and other adjoining places.

The fruit from the *Bassia latifolia* is one of the principal sources of food of the poorer class of Ryots in this part of the country. The price is from 40 seers to 2½ maunds per rupee. The bark is very astringent.

The trees are let out from 8 to 12 ans. per year, to the Ryots and those in the villages are distributed amongst the Ryots of each village, the price of which is included in their yearly rent.

From the fruit or flower, as it is called by some persons, wine is extracted and I hear sugar could be made.

After the wine is extracted the refuse is given to cattle, which tends toward their fattening and causes the cows to give a larger quantity of milk.

If the tree is tapped a white milky sticky kind of a stuff comes out which if allowed to dry is very elastic, but is not now collected or cared for. I send you a small model of the press, *Chaipee.* The ones used are double this size and are generally made out of any kind of hard wood such as sakooah (sal) assin, dhaw, kaind. The long pole is generally of assin or sakooah wood as it is durable and strong. In some places I hear the press is made out of stones which is much better in every way.

Native process of extracting the oil from the nut of the Bhaylah or Bhaylonah, Semecarpus anacardium, as practised in the Zillah of Huzareebag. *Communicated by* MR. CLAUDE DUMAINE.

The nut of the *Semecarpus anacardium* is generally collected about November. When perfectly ripe the lower or fleshy part of the fruit turns crimson red and pulpy which part is eaten in different ways; the gatherer is therefore already compensated for his trouble of collecting them.

The nut itself turns jet black and very hard and smooth.

When a sufficient quantity is gathered the manufacturing commences.

An ordinary size mud handy, the shape of a *lota*, is buried under ground, say about a foot, and is destined to receive the oil; nevertheless about ¼ of it is filled with water, to prevent as they imagine the oil catching fire and being consumed.

Then a much larger one is placed on the top and mud thrown all round to fill the crevices. Before placing it, a hole about ½ inch in diameter, is made at the bottom of it. It is then filled up with nuts and the place surrounded with dried cow dung and set fire to.

It is always lit at night out of the village, so that the smoke which is injurious may not harm any one.

The great heat causes the nut to melt and the oil runs down in the lower handy. The next morning the oil is taken out and the refuse of the nut thrown away. This oil is used in different ways to grease the cart axles which are generally made of wood. They affirm that this oil answers better than any other as it does not get burned up so soon by the friction, but I fancy it is more on the principle of economy, as it is got for nothing and then again cannot be made use of in any other way but to apply to the sores cattle some times get between the hoofs. The wood is useless in the full meaning of the word, not even burned.

By mistake a man who was not acquainted with the tree cut it down and made use of it as fire wood and as he exposed himself to the fumes the whole of his face and in fact the whole body swolled up a great deal; this lasted two to three days during which period the man appeared to suffer a great deal; he could hardly see or eat.

I am not aware that the oil is used in this country but for the above purposes, and marking linen which is generally done by the washermen. It is not sold there. As for the bark, leaves or roots, I am not aware that it is used in any way.

Mode of preparing the Cutch of commerce from the Acacia Catechu. Communicated by MR. CLAUDE DUMAINE.

About January the trees are cut down, I mean the red kind, and a stump of about 6 inches to 1 foot left above ground.

The bark is thrown away and the tree itself is chopped into small pieces the size of about a rupee. The branches are generally taken away for firewood.

The pieces are carried at once to the place of manufacture where a number of mud *gharrhhs* are placed in a line a little inclined on one side, a large leaf is tied to the mouth of it over which the fluid passes and runs into a small one placed close by.

The gharrah is then filled with the pieces of wood and about ⅔ of water, and placed over brisk fire. On its reaching the boiling point the water flows over, and passes in the small handy over the leaf; it is put back again in the gharrah till it is found not to be able to throw out any more.

The gharrah is placed over another one in which the watering or colouring matter runs out and the pieces of wood are dried and used for fuel.

When a sufficient quantity of that stuff (coloring matter) is gathered which is the consistency of ordinary syrup, it is all collected and boiled down for about 2 to 4 hours over a brisk fire; and then to make short work of it, that is bring it to a good substance, the ashes of cow's dung are thrown over mats, and the stuff over it which is mixed up at once.

The process is carried on in the open air under trees.

The white Cutch is seldom cut.

The Cultivation and Extraction of China-grass-cloth or Rheea fibre.—By GEORGE KING M. B., *Officiating Superintendent, Botanical Gardens, Seharunpore.*

Bœhmeria nivea, the plant known as China grass, from the fibre of which China grass cloth is made, is not a species of grass, but a nettle. It is indigenous to South Eastern Asia, and in China is known as Ma or Chú ma, while in Assam, where also it is utilized, it is called Rheea.*

2. *Other fibre-yielding Nettles.* A nettle indigenous to the lower slopes and base of the Himalayas from the Bhurrampootra to the Ganges, and known botanically as *Bœhmeria puya* (the *Urtica frutescens* of Roxburgh) is in appearance rather like the true China Grass plant, and yields a fibre but little inferior. It is distinguished from the latter by its narrower leaves. The vernacular name of this species in Gharwal and Kumaon is Poee, which farther East changes into Púya or Poorah. Its fibre is very strong, and is largely used by the hill men for making nets and ropes. Several other Indian nettles yield fibres which would probably prove valuable if utilized. Chief among these are the following:—

1. *Urtica crenulata.* This yields a white, strong, but not very lasting fibre. It is common in Eastern Bengal where it goes under the name of Chor Putta.

2. *Urtica heterophylla.* An annual plant, yielding a fine, soft, and lasting, fibre; of wide distribution in mountainous

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* The identity of Rheea with the Chinese Chù ma is now fairly established. (See Journal A. and H. Society of India, Vol. vii p. 91.)

districts of India; known as Horoo Surat in Assam: in Ghurwal and Kumaon it is classed along with other nettles under the common term Bichchhú.

3. *Urtica virulenta.*

4. *Urtica salicifolia.*

The tract at the base of the Himalayas abounds in Urticaceous plants from which the hill men extract fibres in small quantity, but of the value of these I am unable to give an opinion.

3. *Character of the plant.* The true China-grass cloth nettle is a herbaceous plant, with large, perennial, spreading, much divided roots, from which rise a number (from seven to ten) of straight, slender slightly branching stems, from the bark of which the fibre is extracted. Naturally twice, but under cultivation three, four, and even five times a year, according to climate and soil, a fresh set of stems shoots up from the root.

The proper time to cut the old twigs for their fibre is when they have begun to become brown at their bases, and the young ones are about an inch in height. In the Government gardens at Deyrah Dhoon, where the object aimed at has been the propagation of the plant, and not the extraction of its fibre, the stems have hitherto been cut down only twice a year. I think however that if well manured and watered, three crops (as is the case in China) might be obtained. It is in the moist climate of Assam that, as mentioned above, four or five crops may be obtained in a year. The plant is a very hardy one, and thrives well in parts of India differing so much in climate and other physical conditions as Assam, Bengal, the North West Provinces, and the Kangra valley in the Punjab. It has also I believe been introduced with success in the Madras Presidency. In Deyrah Dhoon, some old plants throw up shoots from eight to ten feet high, and six feet is a common height. An eight foot shoot, if carefully manipulated, will yield a fibre six feet long.

4. *Limit of growth.* The garden in Deyrah Dhoon is about 2200 feet above the sea level, and the plantations in the Kangra valley are probably higher. There are no exact records known to me showing the height at which the Chinese nettle will thrive best. It grows however freely in the plains at very low elevations. At Seharunpore, which is about 1000 feet above the level of the sea, the plants are very green and healthy, and reach a height of 5 to 7 feet.

5. *Soil and Shade.* The Chinese prefer a rather stiff soil; but, I gather from a communication in a former number of the Journal of this Society that, in Assam a loose rich soil is considered the best. That in the Deyrah Dhoon garden is of the former description; whereas the patch of ground planted with *Bœhmeria* at Seharunpore is rather light and sandy. My own experience, which however is but limited, leads me to think moderate shade an advantage.

The finest plants in the garden here (Seharunpore) are a few grown under trees; and shade appears to be the only condition of growth in which they differ from less vigorous plants near them. Shelter from high winds is of great advantage, as, from the size of the leaves in proportion to the thickness of the stem, the latter is rather easily bent by storms.

6. *Moisture and manure.* A good supply of moisture is undoubtedly required, and regular irrigation would be necessary in the plains of upper India. But of all the requisites for successful cultivation, I believe the first in importance to be *manure*, and this is the one least recognised in Indian Agriculture.

The Chinese manure extensively. They plant out in soil which has been carefully prepared and richly manured. They also use liquid manure, and in the cold season give a top dressing of stable litter after each cutting; whenever it is available they also apply night-soil.

7. *Propagation and Cultivation.* The plant being one of

those in which the male and female flowers are separate, and situated on different parts of the stem, the production of seed is uncertain in localities where the insects are not indigenous by which fecundation is probably for the most part accomplished. In districts where Bœhmeria has been introduced, propagation has therefore been conducted not by seed, but by cuttings, and by division of the roots of old plants. By cuttings it may be propagated very easily, as with ordinary care scarcely one fails to strike. During damp weather, roots of old plants may be freely broken up into small pieces, and these if planted out into well prepared nurseries thrive well. This is the favourite mode of propagation in China.

Both cuttings and fragments of root should be planted about a foot or a foot and a half apart. This however is a matter in which the grower must be guided to some extent by local circumstances. The great desideratum is, that they shall be planted close enough to prevent their throwing out lateral branches, which are injurious both because they prevent the leaders from attaining the height they otherwise would, and because at every point where a branch leaves the stem there is a tendency, more or less great, of the band of fibre to break during the process of extraction; and the value of the fibre is in proportion to its length and equality. The soil between the plants should be frequently broken up so as to keep it loose, and ought of course to be kept free from weeds. Top-dressing with manure is strongly insisted on by Chinese cultivators.

8. *Cost of cultivation.* In estimating the return to the cultivator, the plant being in the ground all the year round, both Rabee and Kureef land rent must be debited against the crop, and also Water-rent where irrigation is necessary. Besides this, allowance must be made for more manure than the native cultivator usually puts on his land. The amount of *labour* wanted in an established field would not be great,

and the nature of it has already been indicated; watching against birds by day would not be wanted, but a guard against pig and especially deer at night would likely be necessary. Major Hannay and Capt. Dalton, two gentlemen who at the request of the Honble E. I. Company gave much attention to the growth of this fibre in Assam, give rather conflicting accounts of the cost of cultivation in that province. Major Hannay estimates the expense at five Rupees a maund (£ 14 a ton) and reports that "Rheea can be produced and sold with profit at as cheap" a rate as Russian *Hemp*." This is stated by Dr. Royle to have been a mistake, and he says that ten rupees were meant.

Capt. Jenkins puts down the cost at ten rupees per maund (£ 28 a ton), and Capt. Dalton, Collector of Luckimpore, states that the lowest price at which it is likely to be procurable by *purchase from the cultivator* is six annas a seer, or about £ 42 per ton, but says that "when it is more extensively cultivated, and the best method of preparation understood, so that women and children may be employed as well as men, it ought not to cost more than four annas a seer or £ 28 per ton."*

9. *Probable produce per Acre.* Not having had enough practical experience of the cultivation of the plant for the sake of its fibre, I cannot venture to say what the produce on well manured, well watered soil in upper India might be. It is stated by Dr. Royle that twelve maunds is the aggregate annual yield per acre in Assam, but there, as has just been stated, four or five crops can be gathered, and I fear only two or at most three could be looked for in upper India. I cannot however discover whether Dr. Royle's estimate refers to thoroughly cleaned fibre, or to fibre in the rough state before the softer vegetable tissues that surround it have been quite removed.

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* See Royle's Fibrous plants of India, quoting from the Journal of the A. and H. Society of India.

10. *Process of separation of the Fibre.* The methods pursued in China are all manual, and they seem to vary in different parts of that country. One way is, to remove the leaves immediately on cutting the stems, to soak the latter for a short time in water cold or tepid according to the season of the year; after this to bend them in the middle so as to loosen the fibrous portion from the woody and cellular tissue of the stalk at that point, and to remove the fibre by introducing the finger at the opening thus made and stripping it off. The amount of soaking to which the stems are subjected varies with climate and temperature, but is never long extended. Another way is, after soaking to cut off the roots, separate the fibre at the root extremity only, and strip it off by drawing it over a pin fixed in a plank. In a third method the stems are split longitudinally by a knife and the fibre peeled off each half separately.

11. *Cleaning and Bleaching.* The fibre thus removed is next scraped, when in a moist state, with a blunt knife. The knife is held in the left hand, its edge being opposed to the left thumb. The strips of hemp are then drawn between the thumb and the blade, pressure meanwhile being made by the thumb. Scraping is often also done on a smooth board, the blunt knife being firmly pressed down on the fibre as it is drawn across it. By these means the softer matters which cling to it are removed, and the fibre thus cleaned, curls up. It is wiped dry, exposed to the sun for a day, and then assorted according to quality. It is next subjected to bleaching processes. These consist in exposure to dew at night, and to the sun by day; excessive moisture being however carefully avoided as the fibre is discoloured thereby. Boiling with alkalies is also practised in order to secure whiteness. As however the details vary a good deal in different provinces of China, I offer no apology for transcribing the following translated extract from the *Imperial Treatise of Chinese Agri-*

culture quoted by Dr. Royle in his work on the Fibrous Plants of India.*

"The stems are tied up in little sheaves and placed on the "roof of a house, in order that they may be moistened by "the dew at night, and dried again by the Sun in the day.

"In the course of five to seven days they become perfectly "white. If the weather be cloudy or rainy, the stems are "placed under cover in a current of air. If they are wetted "by the rain they immediately turn black. Another author "says, after peeling the fibres they are tied in skeins, arranged "in a circle, and steeped for a night in a pan of water; they "are then spun on a wheel. This done, they are again "steeped in water containing the ashes of burnt mulberry "wood. Having taken them from the pans they are divided "into packets of 5 oz. weight each; the packets are placed "for a night in a tub of a mixture consisting of a cup of "pure water, and an equal quantity of powdered chalk to "each packet.

"The next day the chalk is got rid of, and the fibres are "boiled in water containing straw ashes, by which process "they become white and supple. Being now dried in the "sun, they are again boiled in pure water; they are then "stirred about in more water, which finishes the cleansing "process, and lastly they are dried in the sun.

"This done, the fibres are joined end to end on the wheel "so as to make long threads, which form the warp and the "woof, and are manufactured into stuff in the usual way.

"Another author says, after having spun the fibres of "*tokou-ma*, they are boiled in lime water, and when cool, "carefully washed in pure water. Then by means of a bam"boo sieve, placed on the surface of the water, they are "spread out in equal layers in order that they may be as it

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* Page 362. See also Journal A. and H. Society of India, Vol. VII page 36 App.

"were half wetted below, and half dried above. As night "approaches, they are taken out, strained and dried; the "same process is repeated the next and following days, until "the threads are perfectly white. They are then, but not "before, fit for being made up.

"According to another process, the *tchou-ma* is first soaked, then spun and made up, instead of being soaked after "the spinning. Other persons again take the fresh fibres, "expose them at night to the dew and in the day to the sun; "then spin and weave, bleaching last of all. Others, lastly, "following those who employ the plant Ko, cut the stems, "soften the fibres in the steam of boiling water, then weave, "and do not bleach at all. Fibres thus prepared give a "material that is more supple and fibrous."

In Assam, Major Hannay cleaned the newly extracted fibre by tying it up in bundles, and soaking in water for a few hours. When softened, a bundle was put on a hook fastened to a post, and the operator standing in front of it; by taking one strand of fibre at a time in his hand and passing it quickly through his fingers, freed it from the softer vegetable matter, any tougher portion which remained being subsequently removed by a knife.

Following the directions furnished to me by several Chinamen, I made some experiments on the manual extraction of the fibre. The only stems at my disposal were however rather old and hard, and on that account unusually difficult to manipulate. I however learnt enough to convince me that the extraction by hand processes is difficult, slow, and expensive. Steeping in water for an hour or two had no effect whatever in facilitating the separation of the fibre from the stem. I tried steeping in plain water, in water with various proportions of unslacked lime in it, and in solutions of potash of various strengths, and for various periods varying from a day to a week. The stronger alkaline solutions were the most effectual, but whether the use of chemicals has any deleterious action on the fibre, I am not prepared to say. Seeing that potash is used in the preparation of Russian flax, I should not anticipate any harm from its moderate use. I also tried beating the fibre out of the stems both in a fresh state, and after they had been steeped. Pressure I intended to try, but my experiments were limited by a scanty supply of material.

12. *Machinery.* In the Jury Report of Class IV. at the great London Exhibition of 1851, the process of Messrs. L. W. Wright and Co. for separating the fibre from the stem, is described with commendation, and a medal is awarded to Messrs. W. Wright for specimens of the fibre prepared by them The process consists in an arrangement for boiling the stems in an alkaline solution, after they have previously been steeped for twenty four hours in water of a temperature of 90 Fht. The fibre is then washed with pure water, and subjected to a current of high-steam pressure till nearly dry.

The desideratum for the Indian grower is a chemical process or a machine which shall enable him to effect the rough separation of the fibre from the stem at a cheap rate. The English manufacturer prefers to buy the fibre in this rough condition, and to undertake all subsequent processes himself, as in doing so, lies his greatest profit It was found that fibre in the rough state is apt to ferment during its passage to England; and to obviate the liability to this, must therefore be a prominent feature in any successful process of extraction. I think it probable that a machine on the principle of Hill and Bundy's for breaking and preparing the fibre of *raw Flax*, *Hemp*, *Sunn* and similar plants, without steeping or dew wetting might be devised without difficulty, for *Bœhmeria.*

The frame work of Hill and Bundy's machine can, I believe, be made of wood, and its principle (that of conical longitudinally ridged rollers revolving independently of each other) being very simple, I think it suitable for being both worked and made by natives It is possible however that the extraction may be cheaply effected by some chemical process, involving the use of alkalies, and not requiring machinery. Experiments should be made on this point. I hear, that a gentleman in upper India has invented a cheap and effectual process, but as he has not yet made it public, I do not know in what it consists.

13. *Value of Produce.* There being as yet no means of working it into cloth in India, there is no demand for this fibre in the bazars, consequently a price cannot be quoted. In Assam, Rheea fibre is utilized for domestic consumption only, and is chiefly made into fishing-lines and nets. It is with difficulty obtainable by purchase, and naturally yields a high price. The Commissioner of Assam, writing to the Board of Revenue L. P. in 1868, says that in Tezpore, the bazar rate was then one rupee a seer.

Statements as to the price obtained for samples prepared for the English market vary exceedingly. Mr. Sangster, an English manufacturer, who seems to have turned his attention to this fibre, offered Major Hannay only £ 20 for Assam samples delivered in Calcutta. On the other hand, parcels of China grass fibre have been sold in England, since the Exhibition of 1851, at prices varying from £ 50 to £120 per ton. Mr. Marshall, a Leeds manufacturer and a consumer of *Bœhmeria* fibre of Chinese production, valued some samples of Assam Rheea as equal to second class China fibre, and worth £48 to £50 a ton delivered in England; but other manufacturers considered it of higher value than the price quoted by Mr. Marshall.* Samples dressed so as to resemble floss-silk have been valued at the large sum of £ 280 per ton. The discrepancies in the prices realised for the raw fibre may be partly accounted for by the fact that it is apt to vary much in quality, the first cutting of the season in China being always coarser than the second, which again, though stronger, is not so fine as the third. Its value also depends on the treatment it has received during extraction, and on its freedom from a small black spot by which it is often disfigured. There is very little machinery in England suited to the manufacture of this fibre, which is as yet indeed little more than a curiosity in the home market ; and although the few samples hitherto sent home have fetched high prices, a continuance of such rates could scarcely be expected, were it to be imported largely into Britain. As *Bœhmeria* fibre has the recommendations of being long, soft, strong, and capable of being bleached very white, it is probable that it would be well worth while for the English manufacturer to adapt machinery to it, were a regular supply forthcoming. *Bœhmeria* is about the strongest of known vegetable fibres. Dr. Royle's experiments made with equal weights and equal lengths of various unmanufactured fibres gave the following results :—

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* Journal A. and H. Society of India. Vol. ix p. 44.

Petersburgh Clean Hemp,	broke with,	160lbs.
A fibre from Travancore called Wuckoo,	,,	175 ,,
Yercum fibre,	,,	190 ,,
Jubbulpore Hemp,	,,	190 ,,
China-grass from China,	,,	250 ,,
Rheea fibre or China-grass, from Assam,	,,	320 ,,
Wild Rheea, also from Assam,	,,	343 ,,

14. *Experiments in India, and chance of success.* So far back as 1811, some bales of this fibre, though under another name, were sent to England from the Calcutta Botanic Garden.

Further supplies were sent during several subsequent years, and within the past twenty several parcels have gone from Assam.

Some time ago small plantations were formed in the Government Gardens at Seharunpore and in Deyrah Dhoon, and it has been proved by these that the plant grows freely, and is easily propagated in upper India. Private attempts to grow it have been begun in Deyrah Dhoon, and in the Kangra Valley. In the former locality, there is at present a good deal of interest being manifested in it, and I believe a good many Europeans there are disposed to try it, encouraged by the hope of finding a paying mode of extraction, and undaunted by the unfavourable results of the trials already made in the lower Provinces. The one great objection to this fibre is the difficulty of extracting it. The manual processes already mentioned are so very slow and expensive, and Indian labour is so very much inferior to Chinese, that until a cheap and simple machine be put within easy reach of the cultivator or a chemical process be invented, Indian-grown fibre can never, I fear, enter into competition with Chinese, and little progress can be made in extending its cultivation in this country.

SEHARUNPORE:
10*th September* 1869.

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Correspondence and Selections.

Memoranda compiled from various sources respecting Chenopodium Quinoa.

[At the suggestion of Lt. J. F Pogson, of Simla (see proceedings of the Society for July 1867,) for the introduction of *Chenopodium Quinoa* into the Himalaya, and the highlands of Thibet, the Society placed themselves in communication with Dr. Forbes Watson of the India Museum, who has kindly procured for them a supply of seed, and obligingly forwarded at the same time certain memoranda respecting the plant, which, it is thought desirable to publish in these pages for general information.]

CHENOPODIUM QUINOA, WILD

THIS is a herbaceous annual, with a stout erect angular stem of from three to four or even five feet in height, in a good soil, it branches considerably with short erect branches The lower leaves are as large as the human hand, and somewhat triangular shape, on long foot-stalks and of a pale, rather glaucous hue. The small, green, inconspicuous flowers, and afterwards the fruit, are produced on numerous panicles both axillary and terminal. The whole habit of the plant closely resembles the goosefoot and spinach native or cultivated in this country.

Description from Curtis Bot Magazine

Father Feuillée in his travels in Peru and Chili seems first to have brought this plant into notice. Dombey in 1779 sent seeds to Paris, but they did not succeed; nor are we aware that it was known in a living state in Europe till near half a century later, when it was first in cultivation in Paris and afterwards in England. Mr. Lambert directed public attention to it in 1834 and the Glasgow Botanic Garden received seeds of it from Lima which were grown about 1837, and in 1838, it received notice in Curtis' Botanical Magazine.

Moyen remarks "the station of the Quinoa is, it is true, extremely limited, but for those countries in which it is grown, it is, next to the potatoe, the best gift which nature has bestowed upon man. Over all the plateau of Southern Peru, above the height at which rye and barley still ripen

Geography of Plants, pp. 308.

the Chenopodium Quinoa is the principal object of agriculture ; and on the plateau of Chuguito, almost 13,000 feet high, are vast fields quite covered with this plant, which however, do not give the landscape the charm of our beautiful green corn-fields. On good soil this plant attains the height of three or four feet, and bears an immense quantity of seeds, which unfortunately for a long time feed an innumerable flock of birds, like sparrows, for this plant has the disadvantage that all the seeds do not ripen at the same time.

The leaves of the Quinoa are very commonly eaten as a vegetable, and much resemble those of *Chenopodium viride* which is eaten as spinach by the poor of our country, and a variety of the quinoa, as well as of the latter plant, with red leaves, is not uncommon

The quinoa is still cultivated in Southern Chili, but, before the introduction of our grasses it must doubtless have been a more general food, and that not only in Chili, but in Peru, where it is now superseded by our cereals wherever the climate permits their culture. The variety, which, according to Molina is called Dahue by the Indians of Chili and which has ash grey leaves and white seeds, is the one commonly cultivated round the lake of Titicaca.

The little mealy and oily seeds of the Quinoa are very pleasant and nutritious food, and they, along with potatoe, are the common food of the poor inhabitants of the plateau of Southern Peru. There are many different ways of cooking this grain, sometimes the seeds are crushed between stones, and boiled as soup or frumenty ; sometimes the meal is roasted and then forms the chocolate of the plateau ; sometimes chicha de quinoa is made from it.

On the table lands of the Himalayas in Southern Asia a plant very similar to the Quinoa, viz. *Amaranthus fariniferus* is cultivated in the same manner and the uses of, as well as the modes of using, the two plants are also similar."

Climate. From Tschudi's Travels in Peru.

According to Humboldt, as quoted by Loudon in his Encyclopædia of Gardening, 'this plant in Mexico ranks in utility with the potatoe, the maize, and the wheat. There is absence of information from any other source of its cultivation in Mexico. The Peruvian highlands are intersected by numerous valleys situated several thousand feet lower than the level heights, from which they totally differ in character and aspect. These valleys are called Sierra. In this Sierra there are only two seasons throughout the year The winter or rainy season commences in October, but the rains are neither so heavy nor so continuous as in the forest districts. The falls of rain seldom last longer than two or three days in succession, storms of thunder and lightning are very frequent but are not accompanied by snow as in the Puna ; often by hail The thermometer never falls below × 4° R. and during the daytime it is on the average at × 11° R. In April, the summer season sets in bringing with it an uninterrupted succession of warm bright days The nights in the summer are colder than in winter. In the summer the thermometer will sometimes fall below freezing point, and the cold is often very severe. About noon the heat is oppressive though the average heat of the day does not exceed 13, 9° R. The climate of the Sierra favours the natural fruitfulness of the soil which richly repays the labour of the husbandman, but plants peculiar to the warm tropical regions do not thrive well here. Prior to the European emigration only maize, quinoa and a few tuberous roots were grown.

Cultivation.
Translation of letter No 1, from Messrs A. Gibbs and Son referring to samples of Quinoa seed forwarded to India by the Mail of 7th March, 1868.

It is affirmed that any light argillaceous soil is suitable for the cultivation of the quinoa The ground appropriated for the purpose should be ploughed, or well broken up, and the seed sown in furrows, or ridges a yard apart, several seeds being placed at distances of from one to two thirds of a pace apart. Or the seed may be sown in seed beds and afterwards transplanted. By this method the heads of the grain are produced very large and the stem is much thicker.

The seed time is in the spring when the moon is at the full, or on the increase. One trenching up and two weedings are needed at most As radishes and other herbs are usually grown at the same time trenching or earthing and weeding are indispensible.

The harvest takes place seven months after seed time.

In the neighbourhood of Puno it is said to be cultivated in the same manner and grows with the same luxuriance as Alfafa or Lucern (*Medicago sativa*) which is extensively cultivated as fodder for Cattle.

Confirmatory of the above is a report recently received on the cultivation as practised in the Vally Jaiya.

Culture. Translation of letter. No. 2 from Messrs A. Gibbs and Son

In Peru the Quinoa is principally cultivated on the other side of the ridge of the Andes, in the Valley of Jaiya where the height of the ground is somewhat more or less than 3,000 feet above the level of the sea and the temperature is necessarily rather cool as for barley.

ON THE MIGRATION OF CULTIVATED PLANTS IN REFERENCE TO ETHNOLOGY.—BY JOHN CRAWFURD, F. R. S.

The migration of cultivated plants is wholly the work of man, and its history, therefore, a legitimate branch of ethnology. In so far as vegetable substance is concerned, the earliest food of man, on his first appearance on earth, must of necessity have consisted of wild fruits and roots, wild corns and wild pulses, and these would certainly be more abundant than we now find them. The plants resorted to for this purpose would necessarily vary with climate. In temperate regions, the seeds of spontaneous grasses and pulses, and of a few marine plants, with acorns and honey, would be had recourse to. In tropical and subtropical regions, the available vegetable food of the early savage would consist of the date, the cocoa-nut, wild cereals, the yam, and other spontaneous roots.

Some races of man are still found in the primitive condition thus described. The natives of Australia, to this day, cultivate no plant, and have no other vegetable food than a few wild roots. The natives of the Andaman Islands have for their vegetable food only a coarse wild bean, and the still coarser fruit of the mangrove. In a similar condition are the inhabitants of Tierra del Fuego and the Eskimos

Even of the nomadic tribes of Northern Arabia, the chief vegetable food, down to the present day, consists of two wild uncultivated plants, called in the Arabic language *sambh* and *mesâa*, but the technical denominations of which have not been determined. Speaking of the first of these, Palgrave says —"The ripening season is in July, when old and young, men and women, are all out to collect the unsown and untoiled-for harvest."

In America, from Canada to Florida, there grows in marshy land, on the banks of lakes and rivers, a species of grass, the seeds of which yield a nutritious corn similar, but inferior, to the millets of the Old World. This, in one of the prevalent American languages, is called the *tuscarora (Zizania aquatica)*. Although capable of cultivation, it has never been so, the superior maize having most probably dispensed with the necessity for it It is, however, used as a food by the wandering American tribes, as the two plants named in the last paragraph are by the Bedouins. In Southern Africa, the fruit of a species of wild gourd, called the nara, about the size of a cocoa-nut, is used as food by the natives, who, when it is ripe, repair periodically to the plains where it grows, to feast upon it.

It would not be until, through increase of population, and wild plants had become scarce, that the ingenuity of man would be stimulated to multiply them by cultivation. We have an example of the early steps in this progress in the condition of society among the South-Sea islanders, both fair and negro, who, when first seen by civilized man, were found cultivating the yam, the taro, or esculent *Caladium*, the batata, the cocoa-palm, the banana, and the breadfruit, but no cereal and no pulse

In the present paper, I propose to confine myself to the ethnological bearings of bread-plants, and begin with the most important of them, the cereals. These consist of wheat, barley, rye, oats, rice, maize, and several millets. Rye and oats are plants confined for the most part to Europe, but wheat and barley embrace a far wider range, for they extend to all the temperate, and even to the subtropical regions of the whole world, from Spain to Japan, while within the last 350 years they have been transferred, through the enterprise of European nations, to the corresponding climates of America and Australia, in neither of which did any one of the principal cerealia of Europe previously exist either in a wild or cultivated state Rice is the principal cereal of all the tropical and subtropical countries of Asia, from Persia to Japan, and its culture has been extended to Europe only within the historical period. Maize is an exclusive product of America, and was as unknown to the Old World, before the first voyage of Columbus, as tobacco or the pine-apple With a wider geographical range than any other of the cereals, it has invaded every country of the Old World, from the 50th degree of latitude, and is now the bread of many millions of people whose forefathers lived in ignorance of its existence. It is extensively cultivated in the Southern provinces of China, in Japan, and in the islands of the Malay and Philippine archipelagoes,. Speke and Grant found it the principal corn in parts of the interior of Africa which the feet of white man had never trodden before their own, and in Italy and Spain it was a frequent crop within fifty years of the discovery of the New World. This wide and rapid extension maize owed to its adaptation to diversities of soil and climate, its hardihood, with consequent facility of propagation, and its eminent fecundity.

With the exception of rice, which is found growing wild in some parts of India, but which yet may have sprung from the seeds of the cultivated plant, not one of the cereals now enumerated can be traced with undoubted certainty, nor can we state their parent countries. · This must be received as evidence of vast antiquity of cultivation. Ears of wheat and of barley have been found in the oldest Egyptian tombs of the some peculiar species or varieties as those cultivated in the same country at the present day; and in the Book of Genesis, in the poems of Homer, and in the oldest of the Hindu Vedas, these cereals are as familiarly referred to as they are now. Wheat and barley must have been well known to the Egyptians before the earliest of the pyramids was built, for a people feeding on roots and fruits could not have possessed the power or the skill indispensible to the construction of these stupendous monuments. The first culture of these corns, therefore, carries us very far back in the history of man himself. There is no good reason to think that wheat and barley may not have been just as early cultivated in Persia, India, China, and Japan, as in Egypt itself, although we have not the same satisfactory evidence of their having been so; and the same may be asserted of rice for tropical Asia, and even for maize in the case of the constructors of the temples of Mexico, and the builders of Palenque.

Millet, derived from the Latin *milium*, and coming to us indirectly in its present form through the French, is a common term for all the smaller cultivated cereals. These, of many species, are largely cultivated in all the warm countries of Europe and Asia, from the 40th degree of latitude to the equator. The most frequent of them belong to the genera *Panicum* and *Sorghum*, but they are not confined to these two. The late Dr. Hugh Falconer told me that the number of kinds of millet cultivated in the plains or mountains of India is no fewer than twenty-five. In Asiatic countries they form a large portion of the bread of the humbler classes. As to the history of their culture, it goes far beyond all record, and is probably of equal antiquity with that of wheat, barley, or rice. It is impossible to fix the parent country of any of these millets, and the probability is that they are indigenous in many, for we find them growing with the facility and vigour of native plants in such remote and unconnected regions as Italy, India, China, and Japan. Some of them are certainly found in a wild state, and even crops of some of these are occasionally gathered. In some parts of Asia, such as its islands, they seem to have been in a good measure superseded by the far superior corn, the American maize.

A great number of pulses, or leguminous plants, have been cultivated immemorially for food, at least in every part of the Old World. They belong to such genera as *Vicia*, *Faba*, *Pisum*, *Ervum*, *Lathyrus*, *Orobus*, *Cicer*, *Phaseolus*, *Dolichos*. In our narrow vocabulary they are all comprehended under the vernacular terms of peas, beans, vetches, lentils, etc. In those parts of Asia to which the principal cereal is rice, which contains but a small amount of gluten or nitrogenous matter, and where little animal matter is consumed, legumes are largely used as food to make up for the deficiency. Several of the cultivated legumes can be traced to their wild originals in Europe, while other sorts are traced to Africa, Asia, and to America. The only parts of the world that produce no native legumes fit for cultivation were Australia and New Zealand, where they were equally absent as the cereals. This arose from no inaptitude of the soil and climate, for they now flourish in these Austral regions, of every useful species.

The principal plants cultivated and yielding a farina, as substitutes for the bread of the cereals, are the common Potato or tuber-yielding *Solanum*, the Yam or *Dioscorea*, the Sweet Potato or tuber-yielding *Convolvulus*, the Sago-palm, the Breadfruit, and the Banana. There are other plants, such as those yielding arrowroot and tapioca, but of far less importance.

The common Potato *(Solanum tuberosum)* is an undoubted native of America, and there of a temperate climate It is still found wild on the western slopes of the Andes, the tubers being no bigger than filberts. Even the rude red-man was found to have cultivated the Potato before the arrival of Europeans. It was brought from America direct to Ireland, and there first cultivated in 1586, or in about eighty years after the discovery of the New World. It is stated to have been still earlier introduced into Spain and Portugal. From Ireland it found its way to the Low Countries and to Germany, and from Spain it reached Italy and France. It is an object of cultivation in Asiatic countries only where Europeans have colonized or settled, and there chiefly for their consumption, and only since the beginning of the present century. It is successfully cultivated in Australia and New Zealand, which produced no esculent farinaceous root at all, not even the Yam, the Taro, or the Manioc.

The Yam *(Dioscorea)* is a native of tropical and subtropical climates. The genus to which it belongs is considered to consist of several distinct species, natives of both Asia and America, and in many places it is still to be found in its wild state. The plant is a slender creeper, yielding a huge tuber, often weighing from ten up to thirty pounds, consisting of a great mass of farinaceous matter, a wholesome, but dry and insipid food, greatly inferior in flavour to the common, or even to the sweet, Potato.

The Sweet Potato, or Batata *(Batatas edulis)*, is, like the Yam, the plant of a warm climate. It is a native of the tropical parts of both Asia and America, but is stated not to have been an object of cultivation by the native Americans, the first mention of it being by Rigafetta, the companion of Magellan, in the first quarter of the fifteenth century. In the neighbourhood of the equator, the *Batata* grows to a large size, often weighing several pounds ; in Java, I have myself seen them of ten pounds weight, and occasionally they are said to reach even to fifty. In that island they enter largely into the food of the people,—never, however, forming their principal vegetable diet, which is always rice.

One or more species of the genera *Ocimum*, *Arum*, *Caladium*, *Maranta*, *Tacca*, and *Jatropha* yield esculent roots, which, in a rude state of society, in their respective native countries, were the only bread of the people before the culture of the cerealia began. Their starch, in a refined state, comes to us under the names of arrowroot, tapioca, cassava, salep, etc. The plants yielding these productions are, with few exceptions, native of tropical or, at least, of very warm countries. Some of them, in their crude and unprepared state, are either poisonous or acrid, but the savage cultivators had everywhere discovered that heat or edulcoration dissipated the poison, and rendered them wholesome food.

The Taro, or *Caladium esculentum*, formed the principal bread of all the South-Sea Islanders, who had no kind of corn ; and the Manioc, or *Jatropha Manihot*, that of the rude inhabitants of native America, who had but one of the cereals, and even that one not universally known and cultivated.

The Breadfruit *(Artocarpus incisa)*, in so far as concerns its use as bread, is confined to the tropical islands of the Pacific, to the inhabitants of which it formed a considerable article of diet, and, no doubt, contributed materially to the social advancement at which they had arrived when first seen by Europeans. At the recommendation of some theoretical botanists, the tree was conveyed, in 1792, at great trouble and expense to our West India Islands, but with little advantage. In the wild state, the plant exists in the islands of the Malay archipelago, where, however, the immemorial possession of the cereals seems to have superseded the necessity of cultivating it.

Some species of the *Musa*, or Banana, which yield a large portion of farinaceous matter, are, either in their fresh or dry state, extensively used in the warm parts of America as bread, but, as far as I know, never so in any Asiatic country ; and Baron Humboldt generalizes rashly when he asserts that in all tropical countries the Banana takes the place of the cereals of temperate and subtropical regions.

Sago, or more correctly Sagu, is the name of the pith of several Palms, natives of the Malayan and Philippine archipelagoes. The most productive of these Palms is the *Sagus Rumphii* or *Metoxylon*

Sagus. This and other species of the same genus have the peculiarity, among Palms, of propagating themselves both by lateral shoots and by seeds. They thrive only in bogs within the air of the sea, but excluding tidal action. A plantation once made perpetuates itself interminably. A sago palm acquires maturity in about fifteen years. The stem is a mere case containing an immense mass of medulla or pith, which, when freed from fibrous matter, is a starch which, dried and granulated, or subjected to heat in earthen moulds, forms the bread of all the people of the Malay archipelago east of Celebes, as far as New Guinea inclusive. It is consumed also in Sumatra, Borneo, and even Mindanao, the most westerly of the Philippines; but in these places where the cereals have long existed, sago is the bread only of the poor, or of barbarous tribes.

Language often throws light on the birthplace and migration of cultivated plants; and I therefore proceed to offer such remarks as have occurred to me regarding those which I have now been referring to. To begin with the cereals, it will be found that they bear different names in every separate and independent language, or sisterhood of languages. In so far as philology can be considered evidence, this fact would seem to show, not that the culture of the cereals had originated at a single point, from which they were in course of time widely disseminated, but at many separate and independent points, foreign names only distinguishing them in the few instances in which they are exotics. Thus the English name for wheat is essentially the same in all the Teutonic languages. In Irish and Welsh, which are two distinct, independent languages, we find two different names for this corn, it being *cruineached* for the first, and *gwenith* for the last. The *trigo* of the Spanish and Portuguese is but a corruption of the *triticum* of the Latin; while the French *froment* and the Italian *frumento* are taken from a synonym of the same language. But in the Basque which, according to competent judges, differs not only from all other European languages, but from all other tongues, whether ancient or modern, we have two names for wheat wholly different from those of any other tongue, namely *garia* and *ocara.* Having alluded to this singular language, the Basque, I think the names of cultivated plants in it may be safely referred to, as evidence of the comparative antiquity of their culture by the people speaking it. Thus the names for wheat, barley, and oats, are purely Basque, while those for rye *(cecalea),* for rice *(avvoza),* for maize *(maiza),* and for the bean *(baba)* are Spanish. The inference is that the first-named plants were immemorially cultivated by the Basques and the last only introduced into their country after the Roman conquest of Spain; indeed, after the Spanish language had assumed its present form.

If we look into the Oriental languages, we shall find in them evidence of the same tendency. In Sanskrit the name for Wheat is *godhum* and in Persian *gandum*, essentially the same word; but, as the people who spoke the Sanskrit language are believed to have emanated from a country forming part of Persia, it is not difficult to account for the agreement in this case. In Hindi the name is *gehun*, which seems to be an original word. In the Tamil we have the Sanskrit word in the corrupt form of *gudumai;* but the people speaking this language occupy the extreme southern part of India, within from eight to twelve degrees of the equator, and where wheat will only bear fruit in a few elevated tracts; and hence, as an exotic, it bears a foreign name. In Turkish the name of wheat, *baghdoi*, is a native word. In Arabic we have two original and unborrowed ones, *huntah* and *bar.* From this, so far as etymology can be trusted, we infer that this corn is of indigenous culture both in the parent land of the Turks and in Arabia. In Java, within seven degrees of the equator, wheat will only yield grain at an elevation of 5,000 feet above the sea-level, and here it is sometimes called by its Portuguese name of *trigo*, and sometimes by its Persian name of *gandum*,—pointing clearly enough to the parties who introduced it, and even to the comparatively recent time in which it was introduced. An examination of the names for Barley point to similar results as in the case of wheat. This word itself, as it exists in our language, has not, that I am aware, been traced to its parent source; but the name of the hardy four-rowed barley, *bere*, belongs to the Teutonic family of languages, and it was probably the earliest, as the easiest variety cultivated in Britain. The French *orgo* and the Italian *orzo* are but gross corruptions of the Latin *hordeum.* The names for barley in Gaelic and in Welsh are different, the first being *eorna*, and the last *haidd.* The name for oats is essentially the same in these two tongues, namely, *core* for the Gaelic, and *ceirc* for the Welsh; but for rye the name in both languages, *seagl*, is evidently taken from the Latin *secale*, and we shall not err if we conclude that this corn was directly or indirectly introduced into our islands by the Romans. The Basque, again, furnishes an original name for this grain, namely, *garagarra.* The Oriental languages furnish us with similar evidence in the case of barley, as it does in that of wheat. In Sanskrit the name for it is *yava*, of which the Hindi *jau* and the Persian *jo* are certainly corruptions. In the language of the distant Tamils it is a widely different word, *shali*, which is probably but a common name for "corn." In Arabic the name is *shaer*, and in Turkish *arpa*, terms which have no connection with each other, or with those of any languages of Asia or Europe, and so we come to the conclusion that this corn is indigenous, or, at least, that its culture was not borrowed from strangers in the countries in which these languages are spoken.

We cannot determine the native country or primitive locality of the first culture of Rice to any particular Oriental region by philological evidence This corn was unknown to the Greeks and Romans, at least as an object of cultivation, and has no original name in their languages. We may presume that it was equally unknown to the ancient Persians; for, had it been an object as well known to them as it now is to their descendants, it would hardly have failed to have attracted the notice, and to have been described by the Greeks, who had so much early intercourse with Persia. In Sanskrit the general name for Rice is *dhanva*, and in Hindi it is *dhan*, a mere abbreviation of the same word; in the Tamil the name is *shali*. In each of the monosyllabic languages which extend from Bengal eastward to China inclusive, Rice bears a different name. Thus we have it in the Peguan as *ha*, in the Siamese as *kao*, in the Cambodian as *ang-ka*, and in the Anam, as *lua*. The many languages of the Malay and Philippine Archipelagoes are a signal exception to this diversity, for with them the general name is the same throughout, although the languages themselves often differ widely in words, in structure, and in sound. That name is *padi*, varied into *pari*, *pali*, *pasi*, and *vari*, according to national pronounciations, and it prevails not only from one extremity to the other of the great archipelagoes, but extends even to the language of remote Madagascar. There is but one exception to this uniformity, and it is found in the recondite and dead language of Java, called the *Slawi*, which abounds in Sanskrit, and in which the term *dana*, an obvious corruption of the Sanskrit name already given.

The Persian name for rice is *shali*, which, as already stated, is that for it in the Tamil. This leads to the belief that the grain was most probably introduced into Persia from Southern India in the course of that maritime trade which is known to have been carried on for ages between the ports on the western coast of India, where the Tamil is the vernacular tongue, and those on the Persian Gulf. Had this cereal reached Persia from Northern India, its name, as in the case of wheat, would have been traceable to the Sanskrit, or one of its derivatives.

The name for rice in Arabic is *arus*, and this is obviously the source of the *arros* of the Spanish, the *rizo* of the Italian, the *riz* of the French and the *rice* of the English,—the word increasing in corruption from Spain to Britain. It points to Spain as the country where the culture of this corn was first introduced into Europe by the Arabs. Rice, however, was known to the Greeks of the lower empire before the Arabian conquest of Spain ; but they too must have learnt it from the Arabs, for the name they gave it, *aroza*, seems to be equally of Arabic origin as the names which it bears in the modern languages of Europe. The Arabic name itself may be supposed an original native word, and rice itself the indigenous plant of a country, the greater part of which is tropical, and therefore congenial to its growth. The vast importance attached to rice by those of whom it is the chief bread-corn, and perhaps also the tendency of the Oriental languages to run into verbal redundance, is strikingly exemplified in the case of this corn. Rice sports into far more varieties than any of the corns familiar to Europeans, for some varieties grow in the water and some on dry land ; some come to maturity in three months, while others take some four and six months to do so. The Hindus, however, are not content with terms for such broad distinctiens as might be derived from these obvious sources, but have names for varieties, the distinctions between which are unappreciable by Europeans. In the north-western provinces of India, no fewer than sixty-six of these names have been enumerated ; and in Bengal, of which rice is nearly the sole bread-corn the number is said to be still greater. But besides terms for this corn, founded on variety, on season, and on mode of culture, the grain itself bears one name in the straw, another when threshed, one name when in the husk and another when freed from it and a fifth when cooked. A similar redundance of terms is found in the languages of the Malay and Philippine Islands. Such minute nomenclatures seem to point to a great antiquity in the culture of this cereal with the people among whom they obtain.

Maize is, beyond all question, a native of America and before the discovery of the New World was wholly unknown to the Old. The name as known to European nations is taken directly from the Spanish, and it is to be presumed that the conquerors of the New World borrowed it from one of the many languages of that continent. In some of the Oriental languages we have specific names for it, which seem entirely native,—such as *bhutta* in Hindi, *jagyny* in most of the languages of the Indian Archipelago, *katsalva* in the Madagascar. This would lead to the belief that the plant was indigenous where such names were given to it, but the probability is that they were taken from some native plant bearing a resemblance to maize. Thus, in the two princi pal languages of Southern India, maize is named after the chief millet cultivated in the peninsula, the *cholu* or *ragi (Cynosurus Coracanus)*, to which an epithet implying its foreign origin is added. The Turks give it the name of *boghdai Misr*, or wheat of Egypt, which is not more amiss than the names given by the French and English when they call it Indian and Turkey corn.

Philological evidence applied to plants yielding starch, or esculent farina, affords somewhat more satisfactory evidence than in the case of the cereals. One of the most important of the plants yielding this farina is the genus *Dioscorea*, in our language the Yam, and of which a dozen species, independent of varieties, have been enumerated. They are natives of Asia, Africa, and America, but of their tropical and subtropical parts only. The Spanish and Portuguese name of the *Dioscorea* is *inhame*, from which comes the French *igname*, and from that, with Anglo-Saxon brevity, *yam*. I presume the Spanish name to be taken from some American language. In Hindi, the general name given to all esculent bulbs and roots is *alu*. This, Professor Wilson tells us, was the name given by those who spoke the Sanscrit language to a species of cultivated *Arum*, and not the yam, with which, as an extratropical people, they must have been unacquainted. The generic name, *alu*, with the prefixes *phul*, a flower, or *rath*, a chariot, are the names by which the Hindus of the north distinguish the yam. Not so, however, with the Hindus of the south, in whose country the yam is indigenous. As an example, it has in Tamil the specific native name *kalangku*.

Like the word *alu* of the northern Hindus, the word *ubi*, especially applied to the yam, is used generically for all esculent roots and bulbs by the Malayan nations It is one of a very wide dissemination, for it prevails in not only all the many languages of the Malayan archipelago but has been also extended to the Philippine tongues of a very different genus from the Malayan. It has done far more than this, for to the east it is found in the languages both of the lank-haired and woolly-haired races of the islands of the Pacific, while to the west it has reached as far as Madagascar. The original word is of such simple structure that it has undergone no other change than the substitution of one labial for another, or the elision of its single consonant. Among the insular languages there are but few exceptions to this general prevalence, but there are a few. In the principal language of the Philippines, and in the dialect of the Sandwich Islands, the only one of the Polynesian language beyond the northern tropic, we have native names for the yam. One species or other of the *Dioscorea* is, no doubt, indigenous in many of these islands of the Malay and Philippine archipelagoes, and in those of the Pacific. I saw myself wild yams dug up in the woods of an island off the Cape of Cambodia, which probably from the frequency of the wild yam in it, takes its Malay name from it, for *Pulo-ubi*, the island in question, literally rendered, signifies "isle of Yams." No doubt it would be long used as food in its wild state by savage man, and it was probably first cultivated by a people who had made the first steps in progress, who would naturally give it its now wide-spread name. Who that people was, it is impossible to be sure of, but the Malays, or Javanese, as the most advanced and most enterprising, are the most probable.

The Sweet Potato, or tuber-yielding *Convolvulus*, appears to be a native of many parts of the tropical Old and New World. Some have alleged that it was first made an object of cultivation by the native Americans, but when the South Sea Islands, which had assuredly no communication with the American people, were discovered, the sweet potato was found to be in cultivation, and known by a native name throughout, the word being essentially the same, and a native one, varying only in pronunciation, as *kumara*, *kumala*, and *gumala* abbreviated *mala*.

There is every appearance of the culture of the *batata* having been introduced into the Islands of the Malay archipelago. and this by the Spaniards or Portuguese. In the Molucca Islands it accordingly goes under the name of *ubi kastela*, which signifies literally "the Castilian Yam," for the Moluccas had been temporarily under the rule of Spain, already in possession of the neighbouring Philippines. The Javanese, dropping the generic word, and eliding the sibilant in the word Castila call the plant simply *catela*. The Javanese give it also the same name as the Spaniards, namely, *batata* or *patata*. The probability, then, that the Spaniards introduced the plants from the neighbouring Philippines, where it seems, if we are to trust the evidence of language, to have been cultivated by the natives when the Spaniard conquered them. I find the plant accordingly designated by native names in the two leading languages of these islands, the Tagala and Bisaya, in the first of which it is called *gabi*, and in the last *kamoti*,—a word, I may observe, adopted in Spanish dictionaries, and defined as the name of "a kind of sweet potato or *batata*."

In Upper India the plant is clearly an exotic, and shown to be out of its genial climate by the production of poor and small tubers. The name given to it is *shakarcand*, a word half Persian and half Hindi, and both of which signify sugar. The Tamil name is the American *batata*, slightly corrupted into *vatata*.

The common Potato takes its name from the sweet one, for the latter seems to have been known, and even cultivated in the South of Spain before the first. Even at present, the name "potato" is given by the Anglo-Saxon Americans to the *Convolvulus Batatas*, while to the common potato is given the epithet "Irish." At present, the Spaniards call the sweet potato *batata* or *batata de Malaga*, and the common potato *patata*, a mere change of one labial for another. The last is nearly our own name, and its source is therefore obvious The original word is probably a native American one, but of what language I have not heard. The common potato had probably many native names, corresponding with the many tongues of America, for it was found by the discoverers cultivated both in North and South America Whatever the origin of the name, the term is, at all events, better than the "earth-apple" of the French and Germans, or the "white truffle" of the Italians. In Hindustan, where the potato is now successfully cultivated, chiefly for European consumption, the name given to it is *balaiti alu*, or the "European esculent tuber." The Malays give it the name of *ubi Europa*, that is, the "European Yam," and the Javanese that of *kéntang Holanda*, or "tubers of Holland," the *kéntang* being the name of the *Ocymum tuberosum*, or tuber-yielding basil, a plant cultivated in Java for its tubers, which in flavour bear a considerable resemblance to those of the *Solanum*.

Sago, correctly sagu, is simply the name of the prepared pith of the palms which yield it, and has no reference to any particular palm, of which there are not fewer than five distinct species of the genus. The word, probably of the Malay Language, is of universal use throughout the Malay and Philippine archipelagoes, and has long been adopted in the languages of Europe.

The Breadfruit (*Artocarpus incisa*) is known in the Malay archipelago (according to the languages of the country) under the various names of *sukun*, *kluwi*, *kulor* and *tambul*, but none of these are the names which it bears in the tropical islands of the Pacific; and hence we may conclude that the South-Sea Islanders are not indebted for it to the Malayan nations, as they are for some other cultivated products such as the Yam, the Cocoa-nut Palm, and the Sugar-cane. This is, indeed, what may be inferred, without the help of etymology, from the character of the plant, which is of the size of a forest tree, with perishable fruit, and consequently impossible of distant transport by a rude people The plant is, no doubt, indigenous to the Pacific Islands, where alone it sports into several varieties, which have been reckoned as many as five—a proof of long cultivation. Even the name given to the breadfruit is not universal in all the dialects of the Polynesian language, for we have it in the Tonga as *me* and *marnai*, in the Tahiti as *vavo*, and in the Owyhee as *ulu*.

I shall conclude with a few general observations on the relative value of the plants enumerated by me, in so far as regards their influence on social progress. Of these, incomparably the most valuable to man are the cereals. They are the most agreeable and the most wholesome, while they contain the greatest amount of nutriment in the smallest bulk. Their culture, moreover, demands a greater amount of skill and labour than the lower kinds of bread; and this is a quality belonging to them which, as it stimulates industry and ingenuity, is, in a social view, of high value It is useful that several of these cereals should be cultivated together, so that, in the event of the failure of one or two, there should remain others to fall back upon. It must be admitted, however, that, although the culture of several different cereals together may mitigate, it cannot prevent either dearths or famines, since the same drought or blight may, more or less, affect all of them. India, for example, in which a greater variety of cereals is cultivated than in Europe, has, nevertheless, been visited within the last hundred years with many dearths and several great famines, owing to the absence of the means of supplying the deficiency of one part of it by the super-abundance of another. An easy and cheap intercourse between the different provinces of a country and its free commercial intercourse with foreign countries possessing climates different from its own, are the only certain guarantees against scarcities and famines. These conditions, however, can exist only in the most advanced states of society, and are wholly absent in the early and rude stages of it, to which the present discussion refers.

It may be safely asserted that no people ever attained a tolerable degree of civilization who did not cultivate one or other of the higher cereals. The architectural monuments and the letters of Egypt, of ancient Greece and of Italy, of Assyria, of Northern India, and of Northern China, were all produced by consumers of wheat The monuments and letters of Southern India, of the Hindu-Chinese countries, of Southern China, of Java, and of Sumatra, were the products of a rice-cultivating and rice-consuming people. The architectural monuments of Mexico and Peru, and, we have no doubt, also of Palenque, were produced by the cultivators and consumers of maize.

No cultivators and consumers of roots or fruits, it may be safely asserted, ever invented letters, or constructed a durable architecture. Among the Malays, whose bread is rice, the term "root-eater" is one of reproach, equivalent to savage. When the inhabitants of the celebrated Spice Islands were first seen by Europeans, their only bread was sago, or the pith of palms; and notwithstanding the possession even the natural monopoly, of the then much-coveted clove and nutmeg, they were not only ignorant of letters, but had not even the rudest calendar They had not even invented iron, which together, with their clothing, they received from strangers; and, but for the accident of their spices, they must have been downright savages, hardly on a level with the South-Sea Islanders. Had the bread of Britons some 2,000 years ago been confined to the potato, Julius Cæsar would unquestionably have found our ancestors far greater barbarians than he describes them to have been, and they would surely not have encountered him with horses drawing armed chariots.

Perhaps the most advanced social position ever attained by men living on mere roots and fruits was that of the South-Sea Islanders. They cultivated no cereal, not even the humblest millet, but they were well supplied with farina-yielding plants—such as the yam, the sweet potato, the taro, and the breadfruit; still their advance was of the humblest, for they had not even invented pottery or textile fabrics having nothing better than paper for raiment.

It is possible for a people to attain a very respectable civilization when living on one of the chief cereals, although it be not the very highest. The mass of the Russians, and even of the Belgians, live on rye, and the mass of the people of Scotland on oats, although their condition would undoubtedly have been better had their bread been of wheat. The respectable amount of civilization which the Irish had attained after their conversion to Christianity, and which resulted in the adoption of foreign letters, and the construction of the round towers, was accomplished by growers and consumers of barley and oats. Had they been strangers to these, and their main food consisted, as it afterwards did, of a single root, their ancient civilization never could have existed: on the contrary, they would have been on a lower level than the South-Sea Islanders, who possessed a far greater variety of sustenance, with a more benignant climate

But the potato is by no means the lowest quality of bread on which a people can live and multiply. The lowest is that which is most easily produced, that is, which is produced with the smallest amount of skill and labour, and in this respect the banana is below the potato, and the sago perhaps even below the banana. The banana yields a crop in ten months from the time of planting, perpetuates itself by rattoons, and requires little care in its growth. Humboldt reckons that the produce of the same extent of land in bananas and wheat is in the proportion of 135 of banana to 1 of wheat, and that of the potato as 44 to 1. The sago-palm takes about ten years to yield its produce, but grows in a bog where nothing else will thrive, requires no care in culture, and, like the banana, propagates itself by shoots. Mr. Logan estimates the produce of the sago-palm, compared with wheat, as 163 to 1, and as compared to the potato, as 53 to 1. The quantity of nutriment contained in the banana and sago are by no means in proportion thus given, for we have to deduct the large proportion of water which they contain, and the absence in them of gluten, the most nutritious portion of the cerealia. Humboldt informs us that the Spanish settlers in America were so satisfied of the evil consequences of living on the banana that they frequently entertained the violent remedy of extirpating the plant, as the only cure for overcoming the apathy and idleness of those who made it their only bread—the Indians and half-breeds. The sago-feeders, however, are by no means so prepossessed in favour of sago, and never fail to prefer rice, or even the yam and sweet-potato, their consumption of it being a matter of necessity and not of choice.

A plain objection to root and similar crops, as compared to cereals, remains to be noticed. Root crops are, with few exceptions, incapable of being stored for a length of time, so that the superfluity of one harvest shall make up for deficiency of a future one. The potato lasts but for a year at best, and the tropical roots not much longer, while wheat, oats, and barley will keep for ten years; rice, in the husk, for fifty; while with the cereals there is far less difficulty in storing and transport.

MEMO. ON THE COST OF CULTIVATION AND RETURNS FOR LAND MANURED WITH LATRINE POUDRETTE IN THE VICINITY OF CAWNPORE DURING THE YEAR 1866-67

(1.) THE cost of conveying and burying latrine poudrette will not enter into this calculation any more than the cost of the establishment kept for the maintenance of the latrines.

It is presumed that in making this calculation the dry earth system of conservancy is considered to have been effected as far as deposit in the ground, and that the present question affects only the most advantageous method of disposing of the manure after deposit.

The first item of expenditure to be considered will be therefore the preparation of the ground in which the poudrette has lain a sufficiently long time to have become manure.

(2.) The poudrette is originally deposited in parallel trenches 4 feet wide by 1 foot deep, with an interval of one foot between each trench. The earth dug out of one trench being thrown over the one preceding it, as the poudrette is deposited, a succession of parallel ridges is thus formed, when required for cultivation it is necessary to level the surface as well as to dig up the intervening spaces and to mix the unmanured earth of both the surface earth and the intervening spaces with the poudrette manure.

(3.) *Reason for cultivation of sugar-cane.*—The staple crop grown is sugar-cane of the edible kind, which finds a ready sale in every city, the demand for it varying according to the population as does the supply of manure.

It is a crop of which on account of the outlay required in irrigation and manure and purchase of slips for planting there is generally an under-supply, and the cultivation of which by a municipality would probably drive competitors out of the field

The returns are larger than those of any other crop

(4.) *Results of cultivation at Cawnpore in* 1866-67.—The area of land on which sugar-cane was cultivated during 1866-67 was 4 acres, 34 poles, 35 yards. Of this the sugar-cane grown on 2 acres, 3 roods, 32 poles, 35 yards, was sold by auction as a standing crop in October 1867. The remainder 1 acre, 1 rood, 1 pole, being reserved for the supply of the next year's slips for planting. As the cost of slips enters into the calculated expenditure, it will be fair to calculate the price of the reserved crop on the scale of what was actually sold.

(5.) *Reduction for rent of land.*—The land manured was Municipal land rented to cultivators at a maximum of 5 Rupees a beegah, the loss caused by the relinquishment of this income is deducted in item 9, the area being 8¼ beegahs by native measurement.

(6.) *Expenditure and receipt in cultivating.*—Expenditure and receipt in cultivating 4 acres, 34 poles, 35 yards for the year 1866-67:—

	Rs.	As.	P.
a.—Preparation of ground, see para (1) of this Memo.,	204	0	9
b.—Purchase of slips,	229	11	8
c.—Ploughing,	21	0	0
d.—Irrigation,	34	13	0
e.—Weeding,	8	13	9
f.—Pay of a salaried cultivator at 5 Rs. a month,	60	0	0
g.—Rent of 8¼ at Rs. 5 a beegah,	41	4	0
Total Rs.,	599	11	2

Receipts.—

a —Sale of sugar-cane on 2 acres, 3 roods, 33 poles, 35 yards,	1,275	0	0
b.—Estimated price of do on 1 acre, 1 rood and 1 pole,	542	0	0
c.—Sale of native radishes and "Turies," &c.,	104	0	0
Total Rs,	1,921	0	0
Deduct,	599	11	2
Profits,	1,321	0	0
Or profit per acre,	313	0	0

(7.) *Sugar-cane can only be planted on the same ground in alternate years.*—It is found that a second crop of sugar-cane cannot be grown in a successive year, as the first crop is not removed by the time the season for planting the second crop arrives. If the purchasers were obliged to remove the crop before this season (*viz.* from January 15th, to February 28th) the price given would be much smaller.

(8.) *Returns from cultivation of 4 years*—A crop of Jowar has been sown on all the ground manured before the rains of 1867, which was not planted with sugar-cane.

This realized a return of upwards of Rs. 30 an acre. It is intended to grow two crops of Jowar and two crops of sugar-cane on the [illegible]me ground before it is remanured, and the returns on 1 acre will then be at the above rate:—

1 Crop of Jowar,	Rs.	30
1 „ of sugar-cane,	„	313
1 „ of Jowar,	„	30
1 „ of sugar-cane,	„	313
Total,	„	686

If the 1st crop is planted in the rains of any year, the last crop will be removed by April of the fourth year, and the ground ready for remanuring within four years.

(9.) *Expenditure on one latrine per annum*—The following is the estimated annual expenditure on a public latrine maintained on the Cawnpore system:—

	Rs.	As.	P.
1.—Wages of 2 male Mehters at Rs. 4 a month,	96	0	0
2.—Wages of 2 female Mehters at Rs. 3 a month,	72	0	0
3.—Food of 1 Buffalo at Rs. 5-8-0 a month,	66	0	0
4—Shifting earth,	30	0	0
5—Trench digging,	21	0	0

6.—Repairs of latrine,	36 0 0
7.—Repairs of Carts,	36 0 0
8.—Do. of Harness,	12 0 0
9.—Supply of earthen pans,	9 0 0
10.—Miscellaneous (greasing Carts, *&c.*,)	6 0 0
Total, Rs.	384 0 0

Supervision and maintenance of earth drying house are excluded, from this, as the expenditure will vary with the number of latrines. The total expense may be calculated at Rs. 400 per annum. Such a latrine, *i. e.*, for which one cart is adequate, will accommodate about 1,600 persons.

(10) *Expenditure on maintenance of one cart for private home conservancy.*—Where private house and latrine conservancy is maintained in the same way, item

(1)	96 0 0
(2)	72 0 0
(6)	36 0 0
(9)	9 0 0
and ½ (10)	3 0 0
Total Rs.,	216 0 0

will be deducted from the schedule of expenditure in para. (1) and the annual expenditure be Rs. 168 or adding 12 Rs., a computed share of supervision and maintenance of earth drying house Rs. 180.

(11)—*Expenditure compared with returns.*—It has been ascertained that one cart will manure about half an acre in the year. The returns on half an acre are shown to be Rs. 343 or half (685) within 4 years.

This gives a loss of about Rs. 60 per annum on a public latrine, and a gain of about 160 on private house, sanitation of equal extent, *i. e.* for which one cart is adequate

(12)—The general result is that the system of cultivation is quite capable of paying the expenditure on dry earth sanitation where the supply from latrine and private houses is equal. It is probable that the supply from the former would soon become in excess of that from the latter in consequence of the greater convenience to the inhabitants in which case there would be more certainty of the system being a paying one.

CAWNPORE
2nd March 1868

(Signed,) E. C. BUCK,
Secretary Municipal Committee.

SUCCESSFUL TRANSPORT OF AILANTHUS SILKWORMS TO AUSTRALIA.

I am happy to tell you that after many trials the Ailanthus silkworms I sent out have at last reached Australia in safety. I hinted to Dr. Brady that, on the principle of the trout ova, they ought to be kept near ice when they arrived near the tropics and, acting upon this, the result has been most satisfactory. I send you Dr. Brady's letter for your valuable journal.

Dangstein, Petersfield. D. NEVILL.

MARYLAND POINT, STRATFORD, E.

"MY DEAR MADAM,—I was sure that you would be glad to hear of the safe arrival of the silkworms at the antipodes, after the repeated failures, and, therefore, the moment I received my brother's letter, I wrote to tell you the joyful news. In sending out the last supplies I profited by past failures. The former cocoons were packed in cotton wool, which, as a non-conductor of heat, I had hoped would have prevented the chrysalis coming prematurely to maturity, but in this I was disappointed. Some came out on the voyage, but, having no room (being pressed by the wool), died. A few, however, lived to arrive in the colony, but died immediately without opportunity of continuing the species. Those I sent out on the 26th November last I packed differently, and, as you have already heard, with complete success. I had a deal box made about two feet long, sixteen inches broad, and six inches deep, lined with cartridge paper, but only fixed to the box in one or two places, so as to keep the paper in position, and to enable it to be readily removed— the object being that the moths, if hatched on the voyage, might lay their eggs on the paper. I had the box prepared with ledges, into the angles of which I glued the cocoons. I bored holes all round the box, about an inch in diameter, and nailed over the holes fine wiregauze, so as to admit light and air, but at the same time prevent the entrance of any insect. Thus, my moths hatched on the voyage would have space to fly about, with enough light and air to keep them healthy. The result proved the wisdom of this arrangement, for some moths came out on the voyage and laid eggs, which were hatched almost immediately on arrival. Others came out in the colony, and may be said to be the first native-born ailanthus moths. I enclose my brother's letter, from which you may learn all the particulars I know, and you are quite at liberty to print extracts from his very interesting letter, which, when done with, I shall feel obliged by your returning. The box went out by the overland mail, and in any account you may give of this most interesting experiment, I hope you will give due prominence to the great obligation I am under to the Peninsular and Oriental Company for their great care of this precious box. Mr. Bailey, the managing director, most kindly sent *special* instructions to their agents on the other side the Isthmus of Suez to keep this box cool, and, if possible, not to let it be exposed to a higher temperature than about fifty degrees. As it was winter time there was no danger on this side of Suez, while on the other, the neighbourhood of the *ice wells* in these luxurious and well-appointed steamers, it was hoped, would enable the officers without much difficulty to attend to these instructions. The result proved how well they were attended to, and it is hoped that if printed, these lines may meet the eyes of those through whose good offices the Australian colonies may owe the blessing of a future trade in silk. May it be a prosperous one, and may the far-sighted wisdom of the legislature of Brisbane (which has voted 5,000 acres of fine land for this experiment) be rewarded with all the success such wisdom deserves. For myself, I feel very happy that I have been the means of introducing the first young brood of ailanthus. May they increase and multiply to any extent required! To you and to Dr Wallace my thanks are also due, for the cocoons you and he were so good as to supply me with; and to both I feel sure the best reward will be the complete success which has attended our efforts I subjoin a letter from my brother.

"ANTONIO BRADY."

"GLEBE, SYDNEY, January 23, 1867.

"MY DEAR ANTONIO,—Thank you sufficiently I cannot for that splendid box, and without thanks you will, I know, understand my feelings; but it will gratify you and all interested to know the perfect success now achieved The mail came in on Sunday evening the 13th, the letters were delivered here about mid-day on Monday; and after going on board the steamer up and down the harbour for some two or three hours, I found the box on board the Esk, and got it home about four o'clock. On opening, I found five moths, three of them "done" and two just out—the beauties! how I enjoyed the look of them, and of a lot of eggs scattered about in all directions, with some of the loose cocoons which had cracked off. The eggs looked but queer, but I did not disturb them—the whole affair was most admirable, and has done its purpose most effectually; the moths have since come out, about three, and sometimes four a day, but at most irregular times—one or two at dusk, and at all hours, morning, noon, and night, but very wild at first, even the hens; but, the last day or two seem to have resumed the habit common to them in Europe, and are more domestic, especially the males—male and female have several times come all of a sort on alternate days, but I have had six pairs fertile; one, and that the first, laid first day 283; 2nd, 40; 3rd, 25; 4th, 9; total 357 eggs. 2 and 3 pairs, first night—404, 19, 20. 167; 120, 20, 21; and others—4, 1; 62, 19, 20; 4, 2; 162, 20, 21; &c., &c., and others less, but in all some twelve or thirteen hundred fertile eggs—so thus far they looked very well, and they still look to continue the succession, though they behave very differently at present to what is described in books. Some are very fine moths (a large proportion males), some quite small, but on the whole decidedly a fine lot, and justly the admiration of every-one. On Monday, 21st, I left home for some hours; in the afternoon I was thinking the eggs might be shifted with advantage to hatch, but, to my great surprise, in my absence a large number were already out of the shell and swarming about, having hatched apparently about the middle of the day, as none were visible when I went out after breakfast. I lost no time in putting them on leaves, and a large number seem all right now, after two days, but very sluggish. Since then the eggs have continued hatching continuously at all hours, both day and night—but I am, of course, pretty constant in obstetric practice and secure them as they appear, but it is vexing I am so unwell just at the moment, as I have the Japan worms and, some of my own second crop to attend to single-handed, as well, for the weather has been very trying to beast as well as man. Still, all goes on well, and I entertain no doubt one or two generations will acclimatize them thoroughly. I have some in doors and some on the bushes in the open; but, what is strange, those in my room frequently leave fresh leaves to settle on the paper and require "whipping in." The eggs were all very small, forty and forty-five to the grain, but this is not surprising just after such a voyage and transition of climate. The books were also most welcome. Dr. Wallace's essay is a capital practical one, and gave me much pleasure in reading. I had anticipated most that he advises, but not the zinc cylinders which are an improvement on my plan, but I have improved my plan now by securing the cocoons to a perch, which pleases the moths, and suits very well—on the whole I fully anticipate the ailanthus will prove very tractable and easily managable on a large scale, but I shall have to look well after birds, and especially ants and land leeches, which swarm about, as well as flying foxes and native cats. I am much pleased also to think you are looking up Mr. Guerin Meneville, as I much wish to establish a friendly correspondence with him. I am fully prepared for the castor-oil worm when it comes, and shall try the ailanthus also upon it when I can face a little extra work. Castor-oil, I am inclined to think, will do even better than ailanthus, as the plant is, with us, always in leaf and in crop, and very rapid growth.—[*Land and Water.*]

"CHARLES BRADY."

Correspondence and Selections.

ON THE VEGETABLE PRODUCTS USED BY THE NORTH-WEST AMERICAN INDIANS AS FOOD AND MEDICINE, IN THE ARTS, AND IN SUPERSTITIOUS RITES.—BY ROBERT BROWN, F. R. G. S., ETC.

On ransacking my various journals and notebooks, relating to North-west America, I find scattered through them many notices of the economic plants of the aborigines of these countries. Though these memoranda can be of but little use to civilized art or medicine, yet I have thrown them together as contributions to the economic history of plants and the ethnology of a little-known people. The country is, however, very extensive, and therefore much must be omitted, as there are numerous plants and vegetable products used by some of the tribes which I have never visited and of which I know nothing except by uncertain hearsay. The following notes, therefore, principally relate to my own observations and chiefly to the Indians on the Pacific seaboard. These Indians are not much of a phytophagous people. The tribes in the interior live by hunting, and those on the banks of great rivers, such as the Fraser and Columbia, chiefly by fishing, so that they only resort to vegetable diet as an addition to their ordinary food, or as a corrective to the unvarying meals of flesh and fish, chiefly venison and salmon. It is only the miserable "Digger Indians"—the *gens de pitié* of the *voyageurs*—who can be said to subsist to any great extent on vegetable food, varying it with grubs, snakes, lizards, and grasshoppers, the latter of which they devour as eagerly as do the Bedouins of the Eastern deserts.

1. *Food.*—Nearly all of the tribes from the coast of the Rocky Mountains, use as food more or less of the blue lily,—the *gamass* or *la gamass** of the *voyageurs* (*Gamassia esculenta*, Lindl.),—which, in the spring, lends a characteristic aspect to the Western Pacific prairies and open grounds. In Vancouver Island the *gamass* comes into flower about the middle or end of April, and remains in bloom until June,

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* A good account of this plant will be found in the catalogue of Geyer's plants, in Hooker's 'London Journal of Botany,' vol. v.

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when, just as it is fading, the roots are in a condition to be gathered,—until that time it is watery and unpalatable; if delayed longer, it fades away, and it would be impossible to find the *locale* of the root. The gathering is nearly wholly done by women and children, who use a sharp-pointed stick for the purpose, and it is surprising to see the aptitude with which the root is dug out. A botanist who has attempted the same feat with his spade will appreciate their skill. About this period the Indians come from their permanent villages, and encamp under the shade of trees in little brush camps. It is the time when, away from the filth of villages, Indian life appears in its most picturesque aspect, and the twinkling of the *gamass* camp-fires as you pass through the woods at night, have a very pleasing aspect. To the *gamass* gathering come sober-minded young hunters and salmon-fishers to select a partner,—for the hard-working squaw is looked upon by an Indian of rightly constituted mind as a much more desirable acquisition than a mere gawky thing, gay in vermilon, brass wire, and hawk bells, or possessed of these meretricious graces so much prized by men civilized, and, if the truth must be told, by savage too. In Oregon I have seen the roots roasted until they became black; they are then pounded up and preserved in cakes. In Vancouver Island, and generally throughout the country, the roots are roasted (to convert the starch into sugar, though, of course, the Indian knows nothing of the *rationale* of the process) and preserved in bags for winter use. They are sweet to the taste, and appear to be a nourishing and far from unpalatable article of food. The roots of the *Sagittaria sagittifolia*, L., were at one time very extensively eaten by the Indians under the name of *wappattoo*, and, on the Columbia river, there is an island called Wappattoo Island, from the abundance of this plant. Since the introduction of the potato, the use of the roots of *Sagittaria* has much declined, and the name is now transferred to the potato. In the vicinity of nearly every village are small patches of potatoes; but the ground is merely scratched up, and the cultivation far from being properly attended to. Their innate laziness and hatred of any work out of the ordinary routine of their life—not consecrated by tradition and laws made and provided for—will not allow of their either properly attending to these patches or increasing their cultivation and their own material comforts thereby, to the boundless extent which they might, the land costing nothing; however, since the introduction of this useful tuber, the Indians are much less subject to starvation and the uncertain privations of a savage life, and some of them excel in the cultivation of the plant, their potatoes bringing from the whites a higher price than any other. On Queen Charlotte's Islands is held a sort of regular "potato fair" every year, when tribes from all parts come to buy in exchange for the products of their countries and industries. Some of them have strange notions of the best method of cultivation. I once lived in an Indian village for some days, where, regularly every morning, as the squaws were lighting the lodge fires, and preparing the morning meal, the old chief would solemnly stalk through the village shouting in a stentorian voice, "Eat the little potatoes, keep the big ones for seed! Eat the little potatoes, keep the big ones for seed!" The bulb or roots of *Lilium Canadense*, L. *Brodiea grandiflora*, Sm., and *Endosmia Gardneri*, Hook. (S'hah-gok of the Nisqually Indians), are all eaten in the parts of the country where they are found. The roots of *Eulophus ambiguus*, Nutt. are pulverized and baked into bread. Everywhere among the aborigines in Vancouver Island and the neighbouring country, the roots of the ordinary *Pteris aquelina*, L. (Slee-uk of the Tsongeisth), are boiled and eaten as food; they look upon them as a great luxury. This food is no doubt nourishing, as the roots contain a considerable amount of starch. The writer of these memoranda well remembers when, starving in a great north-western forest, and expecting every sun to be his last, how anxiously he and his companions sought, but sought in vain, for the bracken roots! The root of *Peucedanum fœniculaceum*, Nutt, is also eaten, and by some the roots of *Aquilegea Canadensis*, L.,[*] *Erelhronium grandiflorum*, Pursh,[†] *Fritillaria lanceolata*, Pursh, *Allium* (*Canadense* L., and A. *reticulata*, Nutt.) mixed with other food, etc. Douglas says that the roots of *Lupinus littoralis*, Dougl. are eaten by the Indians near the mouth of the Columbia river (Chenooks). I have never known them do so, but I have seen the natives at the same place eat the roots of *Abronia arenaria*, Mennz., which he might have mistaken for the former plant.[‡] Some of the miserable tribes in California, eat the roots of the *tule* [§] (*Scirpus lacustris*, L.), which chokes up the lakes and swampy lands of some portions of Southern Oregon and California. Among the plants eaten by the Kootanie, Colville, and other tribes in that part of British Columbia and Washington territory, is the beautiful *Lewisia rediviva*, Pursh.

[*] Var. *formosa*, Fischer.

[†] This splendid *Erythronium* is figured and described by Dr. Hooker in the June number of the 'Magazine of Botany and Kew Miscellany,' from specimens introduced by me in to England. It is there called *E. giganteum*, Dougl.

[‡] *Vide* also Cooper, Nat. Hist. W. T. Bot. p. 55

[§] *Tule, tula, tulare*, as variously pronounced; derived from the Mexican - *tulill*, The roots are gathered in great quantities, and boiled and eaten like *salep* or arrowroot. In this state they are not unpleasant to the taste, slightly bitter, but are highly valued by the Indians as a nutritive food for carrying on long journeys, two or three ounces a day being sufficient for a man even under great fatigue (Hooker, Fl. Bor. Amer. i. p. 223). These Indians call it Ptleem-asd-ilse-ne-mare, and look upon it as one of the great gifts from the Supreme Master of Life. The root of *Phaca aboriginorum* (Richr.), Hook.,—a plant of the eastern side of the Rocky Mountains, which, however, probably extends to the west of the range,—are gathered by the Cree and Stone Indians in the spring, as an article of food. The root and young stems of *Heracleum lanatum*, Michx., are eaten by some of the coast tribes, and it is also used by the Crees of the eastern slope of the Rocky Mountains as a pot-herb. The seeds of many plants are used as cereals. Thus the seeds of various species of *Pinus* (*P. flexilis*, Torr., *P. Sabineana*, Dougl., and *P. Lambertiana*, Dougl.), are all eaten in the parts of the country where they prevail, and is accordingly the "nut-pine" of that part of the country, though the name is often thought to apply to *P. Sabineana* alone,—a fertile source of error. The Indian climbs the tree and throws down the cones to the squaw beneath, who carefully secures them, otherwise the squirrels would make short work with them. The cones are then scorched to open them and destroy the troublesome resin, so that the winter supply of pine-seeds, which it has been thought would supply such a harvest to the botanist, is perfectly useless, the vitality being extinct in them. When I visited Oregon in 1865, I found that in *P. Sabineana*, as in nearly every other conifer, the "pine-seed harvest" had failed, and the Indians suffered much. One of these pines (*P. Lambertiana*, the "sugar-pine"), yields a sugar, which is occasionally eaten, though it has cathartic properties. It is only found on scorched trees, and in very small quantities. I have, however, heard of a man who devoted himself, for a few weeks, to the business of collecting it, and obtained 150 pounds. It can scarcely be distinguished from the manna of the shops, except by a slight terebrinthine flavour. In times of scarcity the Indians will eat the liber of *Pinus contorta*, Dougl. Along both sides of the trail, in the passes of the Galton and Rocky Mountains, many of the young trees of this species are stripped of their bark, from a foot or so above the ground to a height of six or seven feet. This is done by the Indians during their annual buffalo-hunting expeditions from the Kootanie and Kalisplem country to the plains east of the Rocky Mountains, for the sake of the inner bark which they use as food, as well in its fresh state as when compressed into thick cakes, so as to render it portable (Lyall, Linn. Journ. Bot. vii. p. 141). I am not aware that the Coast Indians make any use of it for food. The seeds of *Vicia gigantea*, Hook., are also eaten. Many species of grass-seeds (*e. g. Elymus arenarius*, L.) are collected for food. They are ground in a mortar, or roasted and made into soup. The seed of the wild rye (*Hordeum jubatum*, L.) is especially held in request among the Shoshones of Southern and Eastern Oregon, and a staple article of diet among the Klamaths; near the Klamath Lake in the same section of country, are the seeds of the yellow water-lily (*Nuphar advena*, Ait.), the gathering and preparation of which I described in one of my published letters.* "Chestnuts" (*Æsculus Californica*, Nutt.) are usually made into a gruel or soup. After being ground in a mortar, they are mixed with water in a waterproof basket, in which red-hot stones are thrown, and then the soup is cooked. As the stones, when taking out from the fire, have dirt and ashes adhering to them, the soup is not clean, and it often sets the teeth on edge. The acorns of several species of oak (*Quercus*) are eaten with perhaps as much avidity as they were by the ancient Britons,—only we are too familiar with the process as practised by the "Digger" to throw any shade of romance around it. The acorns of the Californian oaks are mostly large, and the trees in general produce abundantly, though some years there is a great scarcity, and much misery ensues among the poor natives. They do not, however, contain, in proportion to the bulk, an equal amount of nutriment with cereals. The acorns are gathered by the squaws, and are preserved in various methods; the most common plan is to make a basket with twigs and rushes in an oak-tree and keep the acorns there. The acorns are prepared for eating by grinding them and boiling them with water into a thick paste, or by baking them into bread. The oven is a hole in the ground, about eighteen inches cubic. Red-hot stones are placed in the bottom, a little dry sand or loam is placed over them, and next comes a layer of dry leaves. The dough or paste is poured into the hole until it is two or three inches deep; then comes another layer of leaves, more sand, red-hot stones and finally dirt. At the end of five or six hours the oven has cooled down, and the bread is taken out, in the form of an irregular mass, nearly black in colour, not at all handsome to the eye or agreeable to the palate, and mixed with leaves and dirt. For grinding the acorns a stone pestle and mortar is used.† The nuts of hazel (*Corylus*

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* 'Farmer,' Nov., 1863 (Horticultural Department), etc.

† Hittel's 'California,' p. 392; *vide* also Paul Kane's 'Artist's Journey' for some other methods of preparing acorns for food.

Americana, Walt.) are also extensively gathered as food in some parts of the country where they are found. The fruit of the crab-apple (*Pyrulus rivularis*, Dougl.) are prepared for food by being wrapped in leaves and preserved in bags all winter; when they get sweet, they are cooked by digging a hole in the ground, covering it over thickly with green leaves, and a layer of earth or sand, and then kindling a fire above them. The fruit of the *Cerasus mollis*, Dougl., is also eaten. All of the edible berries of the country are eagerly collected by the Indians, and either eaten fresh or preserved for winter use; indeed, the "berry sun" is a great season with them, and all throughout the lovely summer weather of North-west America, you every now and again come upon parties of women and children, in the woods, engaged in this agreeable pursuit. Equally so is it with the frontier white women and children, who get up parties of this nature for days and even weeks together, into the mountains. I used to come across these marooning parties in my wanderings, and some of the pleasant remembrances I have of my wild north-western life, is the kindness I received from these little-polished, but good-hearted peopele,—acts which I can never return, save by this general acknowledgment in a circle of my fellow-botanists, and I assure you I gladly embrace the opportunity of so doing.* Some of the berries, such as the strawberries (*Fragaria vesca*, L., *F. Virginiana*, Ehr., and *F. Chilensis* Ehr.), will not admit of being dried, and are accordingly eaten fresh or brought down to the frontier settlements and towns and there sold to the whites. Nearly all of the others are dried and pressed into cakes for winter use. During the latter end of the summer and autumn, all around Indian villages, but chiefly on platforms and on the flat roofs of the house, vast quantities of these berries may be seen drying and being superintended by some ancient hag, whose hands and arms are dyed pink with them. When required for use, they are boiled, and form an agreeable dessert to salmon, beaver, or venison diet. The berries thus treated are various species of *Vaccinium*,† *Gualtheria shallon*,‡ Pursh, *Amelanchier Canadensis*,§ L. *Rubus Nutkanus*, ||Moc., *R. spectabilis*, Dougl.,¶ *R. leucodermis*, Dougl., *Ribes divaricatum*, Dougl., *R. niveum*, Lindl., etc.,—in fact, all the edible berries of the part of the country where the particular tribe lives. One of the Vacciniums (*ovalifolium*, Sm.) is well known to all north-western travellers (at least those who have been much among the northern In-

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* A portion of this paper was read before the Botanical Society of Edinburgh, May, 1868.

† "Huckle-berries"

‡ "Shalal."

§ "Service-berry."

|| "Thimble-berry."

¶ "Salmon-berry."

dians) as the *lebrou* plant, being used to make a dainty of that name. The berries are gathered in the autumn, before they are quite ripe, and, after being pressed into a firm cake, it is dried and wrapped in bark and laid by. When it is to be used, a quantity is put into a vessel among cold water, and then stirred rapidly round with the hand, which must be free from grease, until it assumes a paste-like form. More water is then added and more stirring applied, until it assumes a form not unlike soapsuds. In this frothy state it is supped with long wooden spoons, made of *Pinus monticola.* It is pleasant to the taste, with a slightly bitter flavour, and is often prepared in Hudson's Bay forts as an Indian dish, which no traveller ought to leave the North-west without tasting. At their high feast the Indians will sup of this until they are ready to burst, and then waddle to the water, drinking of which seems to allay the distention caused by the other. The Indians (and grizzly bears) of Southern Oregon and California eat the berries of the *Manzanitta* (*Arctostaphylos glauca,* Dougl.), but I have never seen the northern tribes make the same use of the berries of the allied species (*Arctostaphylos tomentosa,* Pursh). The tender shoots of various plants are eaten in the spring, such as the shoots of *Rubus Nutkanus* (canoe loads of which can be seen, in the season, on the way to Indian villages), *Rosa fraxinifolia,* Bork., the green stem of *Ligusticum Scoticum,* L., and *Peucedanum leucocarpum,* Nutt., which are peeled and eaten, as well as the stem of *Erodium cicutarium,* L'Hér = the *alfilerilla* or "pin grass" of the Californians, and some other plants of that sort. They seem to make use of no species of lichen for food, but make compressed cakes of a *Rhodymenia* for winter use. Capt. Mayne, R.N. ('British Columbia,' p 256,) however, says that they boil and compress into cakes "*L. jubatus.*" I never saw them do so, though the statement is not at all improbable (see also Lauder Lindsay, Journ. Linn. Soc. Botany, vol. ix. p. 413—14.) Grass and clover the Digger Indian (little elevated in his dietary above the lower animals) looks upon as great blessings, and eagerly eats them and grows fat on them too. The Californian white clover is, however, very sweet, and, I dare say, to these poor people forms, either raw or boiled, a very agreeable salad to their grasshoppers. Beyond the potato, they have no cultivated plant. Some of the Indians in Oregon used to grow a little wild tobacco, but they now buy the ordinary *Nicotiana* from the whites. I have seen some of them, when tobacco was scarce, in order, as they thought, to get the full benefit of it, inhale the smoke, gulping it down until it comes out at the nostrils and ears They would repeat this once or twice, then hand the pipe to another, and lie down, almost senseless, to sleep off the stupor. In times of scarcity they will smoke the twigs of *Thuja gigantea*, Nutt., and the bark of *Cornus sericea*, L. (the *bois rouge* of the Canadian *voyageurs)*, is usually mixed with tobacco even in times of plenty,—a habit the fur traders have learned from them. The leaves of *Arctostaphylos Uva-ursi*, L., are also extensively used among the Indians and frontier men all over the American continent, either alone or (more usually) mixed with tobacco under the Ojibway name of *Kinikennick*. Luckily for them, though passionately fond of intoxicating liquors, they have not acquired the art of preparing any. The stem of *Acer macrophyllum*, Pursh, contains much juice, but the north-west Indians have never attempted to make sugar from it as in the case of *A. saccharinum*, L., in the eastern provinces; indeed, neither have the whites. The Crees, however, make a sugar from *Negundo fraxinifolium*, Nutt., which probably extends over the Rocky Mountains.

2. *In the Arts and Domestic Economy*.—First I should rank the tree I have before speakn of,*—"cedar" (*Thuja gigantea*, Nutt.), of which the Indians make many articles for domestic use; for instance, lodges, canoes, salmon-weirs, fishing-poles, etc., are made of the wood; "tow," ropes, blankets, mats, cloaks, etc., of the bark; of its tough twigs, withes to sew the canoes together; and Mr. G. M. Sproat seems even to think that it has had a powerful influence in forming the present and past habits of the race who use it so extensively.† Though the canoes of the natives are chiefly built of this wood, in other parts of the country where it is not found "cotton-wood" (*Salix Sconleriana*, Hook.) is used, and the rude "dug outs" of the Indians in Southern Oregon and California are made of the trunk of *Pinus ponderosa*. There is no birch in North-west America which could produce bark to make these beautiful crafts of, as on the eastern side of the Rocky Mountains. The bark of the white pine (*P. monticola)* is in like manner used for weaving blankets and cloaks. The maple (*Acer macrophyllum)* is used for making paddles; hence, the Cowschans call it *kammalcelp* or paddle-wood. The vine maple (*Acer circinatum*, Pursh) in like manner, when it can be procured, is used for making bowls, and *Pinus monticola*, for spoons. The yellow cypress (*Cupressus Nutkaensis*, Lamb.=*Thuiopsis borealis*, Fisch.) is also among the Tsimpsheans used for that purpose, and for making boxes, the sides and bottoms of which are hollowed out of one piece. The roots of *Abies Menziesii*, Dougl., are used for making hats. I have seen a pack of cards ingeni-

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[*] Trans. Bot. Edin., May, 1868.

[†] Trans. Ethnol. Soc. Land. 1866-67, and 'Scenes and Studies of Savage Life.'

ously imitated on the barks of *Pinus monticola* and *Thuja gigantea* for gambling purposes. The gambling disks and polished sticks used by many tribes are generally made of *Acer macrophyllum* and *Cupressus Nutkaensis*. Yew, (*Taxus brevifolia*, Nutt = *T. Lindleyana*, Murr.) is often called in various languages "fighting wood," being used to make bows from. Much of this yew grows near Mount Shasta, in California, and among the Oregon Indians a bow of "Shasta yew" is as much prized as in Europe used to be a "coat of Milan steel," or "a Toledo blade." The arrows are made of cedar and various species of reeds, though north, the former is almost universally used. They have, I may mention, no arrow poison, but I have known some of the California Indians get a rattlesnake (*Crotalus lucifer*, Baird), and irritate it until it had struck repeatedly into the liver of some animal, impregnating it with its virus; they would then dip their arrows into this poisoned mass. All wood is used for fuel, but principally *Abies Douglasii*, Lindl., because it is most common, the branches of which are, in common with other trees, put into a canoe when it is leaking to keep the loads, or the paddlers from the water. At their great winter feasts bark is often used as fuel, it affording a stronger heat. *Pinus contorta*, Dougl., from being full of resin, is used as a torch by the Indians in salmon spearing at night, and at their feasts and dances. The leaves of *Philadelphus Gordonianus*, L., and *P. Lewisii*, Pursh, are used by the natives as a substitute for soap. The amole (*Chlorogalum pomeridianum*, Kunth), or "soap plant," has a bulbous root, which when rubbed, makes a lather like soap, and was much used for washing by the Indians and native Californians, prior to the American possession of the country. It is also used, among other things, for making mats for saddlecloths. In California the aborigines make hats and vessels from a grass known as the "wire grass," and coarse mats of *Scirpus lacustris* and other rushes. Bottles are, as I have mentioned in a former paper,* made of the bulbous stem of *Macrocystis pyrifera*, Ag. The textile plants of the Indians are few, the bark of *Thuja gigantea* supplying the place of most fibrous plants. They can extract a fibre from the stem of *Urtica gracilis*, Ait., the native nettle, and I saw a fishing-net made of it, which the owner, a Seshāāht Indian of Barclay Sound, Vancouver Island, valued at $ 100. Some of the Indians on the Columbia river used to make salmon-fishing nets of the twigs of *Cornus sericea*, L., and the more southern tribes still use the native flax (*Linnm perenne*, L.) to make nets, twine, and ropes. Near the Klamath Lakes I saw it growing in such abundance as to suggest the idea of a cultivated field, and only recently the following extract appeared in the San Francisco (California) 'Bulletin' on the subject of the native "hemp," which doubtless refers to this, or an allied plant:—"A morning contemporary calls attention to the fact recently verified, that large quantities of native hemp grow in the valley of Humboldt river, in the State of Nevada, which is gathered by the Indians, who strip off the bark from the dried wood, and make from it very fine and strong nets. The fibre is said to be longer, finer, and stronger than common hemp; longer than flax, and more easily separated from the wood than either. It is said 1100 tons of the stripped fibre can be collected in Humboldt Valley this season, and its prospective value as a cheap substitute for cultivated hemp, is suggested to our cordage and cotton factories. We may add to this interesting statement a fact within our own observation, that a native hemp is found in many parts of California, especially in the moist bottom of the Sacramento and San Jaoquin rivers. The early Spanish colonists mention that it grew about the Tulare lakes, and was used by the Indians to make their fishing-nets. Its use for this purpose has always been common to the Indians of every part of the State Some years ago, it was quite abundant along the Upper Sacramento. The fibre was long and fine, and easily stripped from the stalk, as it dried on the earth, and very light coloured. We have seen the Indians twist it into very fine and strong thread, with which they made not only small fish-nets, but nets twenty, thirty, and forty feet long, and nearly as wide, with which they caught wild geese, while feeding on the plains. Setting their stuffed geese as decoys, the nets are arranged flat, behind them, with wooden springs, and are sprung over the live geese when they alight, by concealed Indians As many as twenty geese were sometimes caught in this way by a single haul As they struggled to get loose, the Indians rushed forward with sticks and knocked them senseless when they poked their heads through the meshes. The nets required for this use were of course very strong. When a large net was made a number of Indians assembled to assist in its completion, the women being excluded from the sacred circle, though allowed to sit and gossip on the outside. It was enough for them that they were permitted to strip and dress the fibre, sometimes to pound the pinola (pine seeds) and acorns, and to carry in conical baskets, steadied on their backs, bound about their brows, the burdens imposed by their lords and masters. All the work of thread and net-making was done with the fingers, assisted by sticks, something like modern crochet-needles; and this does not seem at all strange when it is remembered that the exquisite cotton fibres of the Hindoos are all made by manual appliances. In the same manner the Indians made from the native hemp some very fine, small nets, in which they bound their thick massy hair behind, in a like manner and with much the same effect as the fashionable *chignon* of our own day. These hair-nets were variously coloured, ornamented with beads, and pierced with feathers or long sticks, covered with snake skin. The despised Digger Indian of California may therefore claim to be the inventor of that most astonishing article of head-gear now in use among civilized women. We do not know if it is to be found anywhere in its old abundance; perhaps not, since so large a portion of the bottom lands, where it flourished so luxuriantly, but not exclusively, has been occupied for cultivation. If it can still be obtained in sufficient quantities, it would certainly be valuable for manufacturing purposes. The excellence of its fibre, for many inferior purposes at least, entitles this suggestion to consideration; and the fact that we have a native hemp of such fair quality warrants the inference, that the cultivated staple could be grown here to advantage. Possibly Indian labour on the valley reservations could be turned to profitable account in gathering and preparing the native production."*

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* "Observations on the Medicinal and Economical Value of the *Oulachan*," etc—Pharmaceutical Journal, June 1868.

3. *Medicine and Superstitious Rites.*—All medicine with the Indian is superstition, and all superstitions have a bearing more or less on medicine. Medicine is with them a mere piece of pagan empiricism. It is emphatically Napoleon's axiom, more trite than true,—putting what they know little about into a body about which they know still less. I would have you to guard, however, against the notion that the "medicine men" are equivalent to the "doctors,"—not so; they are mere sorcerers, and though practising medicine, in so far as sorcery and superstition are concerned, yet the healing art proper is in the hands of old women, who are supposed to be skilful that way, and large fees are sometimes exacted from their patients. Surgery they know little or nothing about. I know a very celebrated (and also a very brave) chief, who had rheumatism of the knee-joint. He diagnosed it to be caused by dirt getting in, and accordingly he absolutely proceeded to bore a hole through the patella, in order that he might get a stream of water in, to wash out the foul joint! For fractures they

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* The writer of this extract, though styling this fibre-plant "hemp," apparently, for the most part, refers to *Linum perenne*, L., while curiously enough, both Pursh (Fl. Am. Sept, i. p. 210) and Douglas (Hooker, Fl. Bor. Am. i. p 106) expressly state, though erroneously that it is never used by the Indians of North-west America for economical purposes

use as we do, splints On one occasion I was travelling in the mountains, my only companion an Indian boy, who, at a distance of several miles from the nearest abode of man, fell and snapped the femur luckily it was not displaced With the aid of cedar *(Thuja)* bark,—used as pasteboard splints —and tearing the boy's shirt into bandages I managed to reduce the fracture, I then raised the boy as well as I could on my back In this manner the north western surgeon and his patient took their way through forest and through swamps, over fallen trees and crawling along cliffs and fording swollen mountain-streams until we reached an Indian village, where I committed him to more skilful nurses Aided by a good constitution and wonderful good luck, the boy recovered, and when last I visited that part of the country, I found him perfectly well, and that my fame had grown very great in the land The liber of *Abies Mertensiana,* Lindl, is sometimes used as sticking plaster Their knowledge of the virtues of plants are, as I have said merely empirical, but nevertheless they are used sometimes in acts "more honoured in the breach than in the observance" No crime is more common among Indian women than that of procuring abortion They generally accomplish this by mechanical means, but some species of plants are also used, such as a species of orchid From the plant, root, leaves, and stems is formed a decoction which is drunk by the women several times a day, until the effect is produced, It is said to be very effectual The scrapings of a human skull are used in the same way, and some species of shells are looked on as what old Master Pomet would call "the sovereignest remedy on earth," for the same purpose The infusion of the young cones of various species of pine and fir is thought to be very useful in preventing women bearing any children The roots of a geranium are also used among the Lilloets in British Columbia, for the same purpose Among the Pondereille Indians the rattles of a rattle-snake are thought to ease labour I have heard much from the Hudson's Bay officers about the virtues of a species of *Valeriana (?),* called "kunko," by the M Leod's Lake and other Takali tribes in British Columbia, as a specific in rheumatism The berries of *Symphocarpus racemosus,* Mich, are used about Lilloet for colds *Berberis aquifolium,* Pursh (the "Oregon grape"), the juice of a *Betula, Echinopanax horridum,* Sm, and an infusion of leaves of *Abies Douglasii,* or other fir, under the name of "spruce-tea," are all held in great estimation among the Indian and frontier-men in venereal diseases* A decoction of the roots of the *Berberis* has long been held in great esteem among the Indian tribes in the north, and is equally well known and valued among the back-woodsmen and frontier miners, hunters, and others accustomed to mingle much among the native races. It is an excellent tonic, and there seem to be some good grounds for this universal appreciation of its properties as a curative in syphilitic and other venereal diseases now becoming so rife among the Indians and on the frontier. I saw the roots of some species of *Umbelliferæ* (*Archangelica peregrina* Nutt.?) employed with manifestly good effect as a poultice to inflammatory swellings. A decoction of *Achlys triphylla*, DC., is used as a remedy for pain in the breast. The leaves of *Psrolea physoides* Dougl., are used as a poultice. The leaves of *Heuchera cylindrica*, Dougl., are applied in a bruised condition, to boils, by the Nisqually Indians. *Brunella vulgaris* L. is mixed with grease and applied to swellings. The roots of *Trillium ovatum* Pursh, are used as a poultice, and an infusion of the roots of *Polypodium vulgare*, L., being sweet, are used to be drunk with the decoction of *Berberis Aquifolium* formerly referred to. One would think that *Conium maculatum* L., would be a dangerous thing to meddle with, yet the Indians of some tribes use an infusion of the plant it is said with good effect, in diarrhœa. The juice so classically known as a poison, is not used, and the infusion is mild, so that I never heard of any evil effects ensuing.

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* The roots of *Aralea nudicaulis* are said to be used by the Crees in venereal diseases They also apply the bruised bark to recent wounds (Hook l c *vide* Richardsons, i. 274)

Like all superstitious people, they have "medicines" to produce mental effects, or to make them skilful in their employments. The notion is a very old one, and is not yet extinct in Europe while in Africa and other savage countries it is one of the canons of superstition. Shakespeare referred to it in his day. Thus, in 'Henry IV' (part 2) the following passage occurs:—

'I am bewitched with the rogue's company. If the rascal had not given me medicine to make me love him, I'll be hanged; it could not be else, I have drunk medicines.'

A belief in "love philtres" is very common among the Indians. The Tsongeisth girls rub themselves with the roots of the orchid mentioned to gain the affection of their sweethearts. The roots of *Erythronium grandiflorum* and *Ranunculus* (*R. reptans*, L., *R. occidentalis*, Nutt., etc. are also used with a view to the same end. The roots of a species of *Umbelliferæ* (*Conioselinum Fischeri*, Weim. and Grab.? are also used in this superstition by the Tsongeisth. The roots are dried, and then pounded or mixed with some others, put on the garments of the person on whom it is desired to operate, or kept in the mouth of the person who is employing this piece of witchcraft. They have even a plant which is used to make a *man* cry! Indian girls look upon this as a great triumph, but I could never learn what plant produced this lachrymo-potent medicine They have a medicine *to* help them to be skilful in killing whales, and even one to simulate virginity! I do not think that the northern Indians know any thing of the action of poisons; though I have heard of some individual who had a box buried near his lodge which contained "medicine" with which he threatened to poison the whole famaily of an unwilling bride, if they did not yield to his marriage with her. The infusion of the roots of *Megarhiza Oregana,* Torr. and Gray, put into little ponds in the woods is said to be used to stupefy deer, which come down to drink, and thus fall an easier prey to the Indians. There used to be a scandal in San Francisco, that. it formed the chief ingredient in "Stoughton's bitters!" Pine gum is continually chewed by the northern Indian women; to the use of it may be attributed their beautifully white teeth The natives make no turpentine, but much is now manufactured in Oregon and California, and an experiment was made in Vancouver Island which promised success The "poison oak" (*Rhus toxicodendron,* L.) grows abundantly in many parts of Southern Oregon and California. There are several species, but the present one is the most common, and as the effects of all the others are similar, these may be considerd under its description. It thrives best on a moist soil, and in the shade. In a thicket in the shade, with other bushes, it sends up many thin stalks, eight or ten feet high, with large, luxuriant leaves at the top; in the shade the leaves are green. In the open ground, exposed to the sun, and without support from other bushes, the poison oak is a low poverty-striken little shrub, with a few red leaves If it can attach itself to an oak-tree, it becomes a parasitic vine, and attains a thickness, though very rarely, of four inches in the trunk, and climbs to a height of forty feet.* It affects the skin of most people in a very painful manner, and the inflammation speedily spreads from one part of the body to another. Some people are so affected that their faces could not be recognized, and others (like the writer of this paper) are not affected by it; but instances are not uncommon of persons who have supposed themselves proof against the poison, but have at last been affected. After having been once injured they are ever after very susceptible to the poison. Even passing to the leeward of a bush on a windy day, or through the smoke of a fire in which it is burning, will "bring the poison to the surface" again. In some parts of California cattle are there affected by what is known as the "milk sickness." On breaking a stem of the *Rhus* a milky fluid is exuded which is exceedingly poisonous, and if applied to the skin, will produce effects like that of nitrate of silver. A black welt is produced which, in a few hours, becomes sore, destroys the cuticle, which sloughs off, and upon healing leaves a circular cicatrice. So poisonous is it, that it pollutes the air where it grows. Children, and even grown-up people, who are gathering berries, or otherwise approaching its vicinity, are often badly poisoned Their faces are frequently swelled until their eyes are shut; the neck, hands, and arms covered with inflamed vesicles, the cuticle highly inflamed and not unfrequently constitutional symptoms are observed, resembling those of "milk sickness." The nostrils of cattle grazing amongst it are often covered with pustules. Indeed its effects are described as almost approaching the fabulous Upas-tree, which that "Puck of Commentators," George Stevens, invented, and Erasmus Darwin handed down to posterity in the stately verses of the 'Botanic Garden.' Though well known for a long period (there is a paper on it in the 'Philosophical Transactions' of last century) it has never yet been thoroughly investigated.* The Indians seem rarely to be troubled by it, and the native Californians look upon an infusion of *Grindelia hirsuta,* Hook and Arn., a composite plant, as a cure for its noxious effects. There may be said to be no rattlesnakes west of the Cascaed Mountains, at least, north of the Columbia river, though they are sufficiently abundant to the eastward of that range, as far north as Frazer river, where I have known several Indians to be bit by them. Their usual plan is to brand the wound, having previously tied a ligature between the heart and the bite, or to push the wounded limb among mud immediately on receiving the poison. It is said that by this means the poison is washed off, and that the person often escapes death. The only effectual cure I have found is drinking immoderately of spirits, until, indeed, no more can be drunk. I know a gentleman who was bit, once by the well-known copperhead snake of the Western States (Missouri), and twice by the rattlesnake in Oregon, and recovered by this treatment. The country people have innumerable specifics for their bites, but I cannot [illegible]rn that any of them are reliable.

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* Hittel's 'Calif,' 103.

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* *Vide* Dr. Isaac Mendhall, in 'Cincinnati (U. S) Lancet and Observer,' March, 1861 Chase in *Ibid.*, May, 1861; article in 'Chicago Medical Journal,' June and July, 186[illegible]; Canfield, in 'Edinburgh Botanical Society's Transactions,' 1859; and Bigelow, 'Medical Botany.

The Indians of Central America have several remedies from the vegetable world, and all the tribes north to British Columbia are said to possess some herb or other, but I have generally found them to adopt the treatment I have given above In California, the leaves of *Daucus pusillus*, Mich, the *yerba de la vibora*, or 'rattlesnake herb" of the Spaniards, are said to be a cure for the bite * I will conclude these stray notes by an account of the extraordinory effects of the roots of *Clematis Douglasii*, Hook, on exhusted horses It was at a horse-racing of Nez Percez Indians that it was witnessed One horse was seen which had fallen down The Indian put a piece of the root (the outer coat scraped off) into the nostril of the animal The effect was surprising The creature sprang up under convulsions, and was then brought to the river and bathed, and I found several which had been so treated afterwards grazing with the herd apparently without having sustained any injury "†

What I said in the introduction to these fragmentary notes, I may now repeat in conclusion, *viz*, that they are by no means complete, especially in the latter section Often you see vegetable products in possession of the Indians, when either through want of opportunity, season, or inclination on the part of the possessor, it is impossible, even should the plant yielding grow at the season and in that part of country, to discover the botanical name of it, or obtain a specimen Again, an Indian sorcerer, doctor, or 'wise woman" will search for a whole day for the proper plant, and however ridiculous we may look upon its virtue, they think otherwise, and naturally are in no way willing to ventilate the secrets by which they earn large fees ‡ The present memoranda may, however, serve as examples of the superstitions of a fast dying off race (*Pharmaceutical Journal*, 1868)

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* Pigs have a peculiar antipathy to snakes of every description and particularly to the rattlesnake Instantly on seeing it the pig will rush towards the venomous reptile place its foot on its head and most adroitly kill it A few pigs will soon clear a district of snakes At one time the Dalles of the Columbia was perfectly infested by these disagreeable neighbours They would even enter the houses and crawl under the beds Since the introduction of pigs consequent on the county being more settled up not one can be seen for miles around The pigs are said not to be affected by the poison The snakes likewise seem to dread the pigs and this is so well known to the Indian women that they will often beg a piece of the skin to wrap round their ankles when gathering berries in the bush in order to protect them from snakes

† Geyer Hooker's Journ Bot vol vi p. 66

‡ I have known one woman get five blankets, valued at £2 10s for allaying a very simple swelling

CLIMATE AND FLORA OF OOTACAMUND.

This, the principal sanitary station of Southern India, is the highest European settlement on the Neilgherry mountains and lies in an irregular oval basin running S. W. by N. E., surrounded by low rounded hills gradually rising from the S W. to the N. E., where they join the lofty Dolabetta range. These hills are generally composed of underlying gneissic rock capped by greenstone and disintegrated felspathic rock, which, wearing down by time and exposure, afford a stiff loamy soil of considerable fertility when properly brought under cultivation. In some of the hills iron occurs in considerable quantity, giving them a sharp angular outline. The residences of Europeans are generally situated on the sides of the oval basin above mentioned, and are imbedded in groves of Acacia Melanoxylon and A. dealbata, and have a most picturesque appearance. These two species of Acacia were originally imported from Australia, but have now become so common as to give a marked feature to all the settlements on the hills—the former, with its erect pyramidal habit and sombre hue, contrasting well with the airy graceful habit of A. dealbata. This latter species has a most beautiful appearance when in flower, which is in August and September, the flowers being produced in great profusion, and resembling masses of golden-coloured wool. Both of these trees are also largely planted for firewood, A. dealbata especially, as from the abundance of suckers it sends up, a scarcity of this commodity need never be apprehended when the trees have fairly established themselves. Acacia lophantha is likewise very common, but from its rough straggling habit is but seldom planted ; it springs up, however, in myriads wherever its fallen seeds find sufficient moisture to germinate. Several other species of Acacia are also introduced, but not in such quantity as to give any feature to the settlement. Two species of Eucalyptus, E. globulus and E. giganteus, are, however,s being now introduced and largely planted, and will no doubt be highly beneficial to the Neilgherries, as their timber, according to report, is scarcely inferior to Teak.

The gardens of European villas are well-stocked with Roses, Fuchsias, Verbenas, Dahlias, &c., all of which thrive well. Fruit trees are largely planted, but their produce does not usually come to any great degree of perfection ; sometimes in good situations a fair crop is obtained and of good quality, but this cannot always be depended upon—these are Apples, Pears, and Plums ; Grapes, Peaches, Figs, Oranges, &c., will not bear, but thrive well at about 1000 feet lower elevation, where the temperature will average 10° warmer. Vegetables grow well, and are extensively cultivated by native gardeners for the supply of the Ootacamund market, which is held on Tuesdays; the demand for these is very great. Potatoes are largely grown in Ootacamund, but are of an inferior quality, owing to the tracts selected for their cultivation being peaty marshes, which, being imperfectly drained, retain a great deal of stagnant water, making the Potatoes waxy and watery; two crops are gathered in the year, one early in June and the other in December.

The general aspect of the country situated around Ootacamund is that of low rounded hills, with bare grassy summits, and ravines filled with dense forest. Of the arborescent vegetation, Rhododendron arboreum is a conspicuous member, never forming forests of itself, but scattered over the country in an isolated manner. A pink and a white variety exist, the latter very rare. This plant, from having a ferruginous pubescence on the under side of the leaves, has been called R. nobile by Dr. Wight, the arboreum of the Himalayas having a white pubescence Of the other indigenous trees two species of Eugenia, two of Ilex; Michelia nilagirica, a handsome Magnolia-like plant, with large white flowers; a Microtropis, two species of Millingtonia; Vaccinium Leschenaultii, producing a fruit similar to that of the Whortle-berry of Great Britain · Myrsine capitellata; Stemonurus fœtidus, the flowers of which when opening have a very powerful smell of carrion; Sapota elengioides, Pittosporum teraspermum, and Cleyera gymnanthera form the greatest bulk on the upper plateaux of the Neilgherries. Salix tetrasperma is also common in moist valleys. Of shrubs Hedyotis Lawsoniæ is one of the prettiest, bearing in profusion panicles of pale lilac-coloured flowers, with dark green shining leaves; several species of Crotolaria are common, the finest one being C. Wightiana, a sub-scandent species. Myrtus tomentosa is also very common, yielding a fruit much eaten by the natives, and made into jellies by Europeans; it is locally called "Hill Guava," and "Hill Gooseberry." Hypericum Hookerianum is also a handsome plant, occurring plentifully on sunny slopes, its bright yellow flowers being conspicuous at a considerable distance. A Dodonæa is very common, also a Lasianthus, a Coffea, a shrubby species of Lonicera, a Rhamnus, Viburnum Wightianum, two Osbeckias—O Wightiana, a large purple-flowered shrub, growing by the sides of streams or on wet rocks in exposed situations, and O. Leschenaultii, a pretty little pink-flowered species, found in valleys where there is a good deposit of soil. Gaultheria Leschenaultii is also a very pretty low-growing shrub, forming considerable masses on the upper part of the hills, its snow-white flowers being succeeded by bright steel-blue berries. Three species of Rubus occur very plentifully on the upper part of the hills, one of which is a very glaucous species, called here the "Raspberry;" the other two bear a yellow and black fruit respectively, and are of considerable merit, the latter especially.

The undergrowth in the forests is principally composed of Acanthaceæ, which are also found in exposed situations ; one species, Strobilanthes Kunthiana, grows extensively in bare stony places fully exposed to the sun ; it is a biennial blue flowering plant, and from the profusion in which its flowers are borne, gives the tracts it inhabits quite a blue appearance. Piper nigrum and a sweet white-flowered climbing Jasmine are also common in the woods. Of the herbaceous and low-growing vegetation, Impatiens Leschenaultii is a conspicuous member ; it grows most luxuriantly in good soils well-drained, and prefers an exposed situation ; another species of Impatiens is common in damp places, and may be seen, when in flower, of all shades between red and white – it is by far the prettiest species on the hills. Impatiens scapiflora is very plentiful in Grass lands Soncrila elegans also grows plentifully, and may be found on moist rocks in forests, or in the vicinity of water in exposed situations ; in the latter places the plant is much more sturdy, and the flowers of a brighter colour. Two Bupleurums are common—B. ramosissimum, and B. plantaginæfolium, the latter having much the appearance of a green-leaved Dracæna Pilea smilacifolia is also very common. A Doronicum, an Anemone, a Ranunculus, and Pedicularis Wightiana grow very plentifully in pasture land, the latter being a most beautiful object when in flower; its blossom being of a bright magenta colour ; several Gnaphaliums grow in great profusion all over the hill tops, along with a species of Leucas. Tradescantia pilosa, and a little blue Commelyna may also be found in great abundance all over the hills, as also a pretty little red-flowered Indigofera, Two species of Fragaria are common, one of them, F. elatior, yielding a very good fruit ; and in shady places a pretty Anæctochilus-like plant grows in great abundance ; it grows equally well either in peat or loam. In marshy land, Parnassia Wightiana, Drosera Burmanni, and D. peltata, and a little blue Utricularia, with numerous species of Cyperaceæ and Gramineæ, form the principal vegetation ; and in moist but well-drained land a beautiful little Gentian grows abundantly. Lobelia excelsa grows everywhere, and in such abundance as to form a marked feature in the landscape ; and Kalanchœ grandiflora grows freely, only in rocky places. A Graminaceous plant, nearly allied to the Bamboo, and from 12 to 20 feet high, covers large tracts, in some places to the exclusion of other plants. Terrestrial Orchideæ are well represented both in number and species, their pseudobulbs being dug up and used as salad. Epiphytal Orchideæ are rich in numbers, but not in species, being principally Saccolabium rubrum, S. paniculatum, two or three species of Oberonia, and a minute green-flowered species: these occur in all situations, but thrive best where their roots can reach a good bed of decaying vegetable *débris;* in places where they are more exposed the growth is not so luxuriant, as decaying vegetable matter which would otherwise feed them is either blown away, or its moisture speedily evaporated by the sun's heat. Ferns are numerous, both in numbers and species Pteris aquilina covers large tracts, as in Britain; Pteris quadriaurita and P. cretica are also very common, and Cheilanthes farinosa grows in abundance in rocky exposed situations. The genus Asplenium is well represented, the most common species being A. formosum, A. furcatum, and A. tenuifolium, the latter a very pretty little Fern. Several species of Pleopeltis exist in great abundance, in company with Elaphoglossum conforme; Adiantum æthiopicum is common, also Gymnopteris Féei, and Loxogramma involuta. Of Lastreas, L. hirtipes, L. patentissima, and L. octhodes, are most abundant. Polystichum angulare grows plentifully everywhere, and a pinnate species, P. auriculatum, is common in woods; Botrychium virginicum var. lanuginosum is also plentiful in most loamy soils.

Loranthaceæ are well represented, covering many trees to their ultimate destruction. Acacia Melanoxylon is especially liable to be overrun by these, notwithstanding the amount of tannin its bark contains. They will attach themselves to nearly all kinds of trees, with the exception however of the Coniferæ; on these they do not seem to grow. On the garden varieties of the Fig and Peach they grow vigorously, their eliminating power in the former case being well shown by their own juices not being milky. Their germination is very peculiar: the seeds are imbedded in a viscid fluid contained in a semitransparent skin as in the Yew, if the seed be pressed out, the viscid fluid adheres to it as a thread, and falling on any branch or laef there attaches itself, leaving the seed suspended; the radicle then protrudes from the lower end of the seed, and expands into a trumpet-shaped disc; it then elongates, the disc at the same time curving upwards until it meets the branch, on which it firmly grows, and in a few months becomes a vigorous bush. If however it falls on a leaf or on its own branches, the seed will germinate until the curved disc reaches its own support, after which it dies. Some species of this order are very beautiful, the finest being L, neilgherrense, which grows to perfection on Rhododendron arboreum, and when in flower is a complete blaze of scarlet. Two species of Viscum, V. moniliforme and V. orbiculatum, occur, though sparingly.

The climate of Ootacamund is peculiar; in the winter months the thermometer in the shade frequently rises up to 77° Fahr., and at night will descend to 35°; in cold, land-locked hollows, it has gone down to 20°, consequently hoar frost sufficiently severe not only to nip many introduced plants severely, but also much of the indigenous vegetation. Frost, however, in the true meaning of the term, is quite unknown, the hoar frost which does occur being caused by excessive radiation in clear bright nights. The spring is a most genial season, the mean temperature much exceeding that of the other season. At this time it is interesting to watch the progress of vegetation; though the soil may be dry and parched, and the dry and wet bulb thermometers indicate a difference of 20°, still the trees will begin to shoot, sometimes a month or even more before a drop of rain falls, and make young growth a foot or 18 inches long before they receive a drop of rain, and dew at the latter part of the dry season is so scanty that a difference in the thermometer of 10° at 7 A. M. is a common occurrence. When the spring rains set in they are usually heavy, accompanied by severe thunder storms, and alternated by periods of fine growing weather. In the beginning of June, the south-west monsoon usually sets in; it is characterised by high winds blowing steadily from the south-west, accompanied by much rain and dense fog. The weather is cold and cheerless, the thermometer sometimes showing only 2° or 3° difference between day and night, the average being about 54°. No thunder occurs during the monsoon, and its occurrence which is about the end of August, may be taken as a sign that the monsoon is over; the weather between this and the middle of October is alternated with showers and sunshine, after which the north east monsoon commences, the characteristics being much the same as the other, only that the rainfall is greater. The rain will now last more or less until the 8th or 10th of December, when it usually clears up for the four or five months A Table is annexed below, showing the temperature, rainfall, &c., of the different months.—

	Mean Max. in Shade.	Mean Min.	Rain-fall.	Mean Dry Bulb.	Mean Wet Bulb.
1864. January	..	..	..	56	51
„ February	..	..	..	58	52
„ March	..	.	0.08	62	55
„ April	..	..	8.27	59	57
„ May ...	..	..	6.38	59	58
„ June ...	.	.	5.23	59	58
„ July	61	50	8.66	55	54
„ August	64	50	6.16	56	54
„ September	65	...	3.92	56	54
„ October	67	49	3.55	56	52
„ November	68	47	2.64	56	52
„ December	71	46	0.86	56	49

(*G. B. in Gardener's Chronicle.*)

ROBERT'S DIFFUSION PROCESS IN INDIA.

To the Edditor of the "Engineering."

SIR.—The second campaign with the diffusion of cane, has just terminated at these works, and I have much pleasure in giving the following summary of our experiences for the benefit of those interested in the process.

The results have been as follows :—

1. The total quantity of cane cut up, 3,300 tons.
2. The maximum quantity cut in 24 hours, 105 tons.
   The average quantity 70 tons.
3. The maximum number of cutters at work, 5.
   The average number not, 4.
4. The quantity of juice extracted, 85 per cent.
5. The weight of green sugar obtained 13-33 per cent.
6. The weight of centrifugalled sugar obtained, 9 per cent from first and second product only.
7. The Megass was the fuel used for driving the cutters and diffusing the cane.

The average composition of the cane was :—

13.74 crystalizable sugar.
1.26 glucose.
.54 foreign substances.
15.54 in 100 parts cane or
17.26 in 100 parts juice or
11.94 extractable sugar in 100 canes.

The residue or Megass was repeatedly analysed and was found to contain from O. 13 to O. 4 sugar in 100 parts canes and representing to O. 76 to 2 35 per cent juice, the waste water on analysis gave O. 05 to 18 per cent sugar or O. 35 to 1. 98 per cent juice, making the total loss of juice from 1.3 to 4,34 per cent, so that the extraction of saccharine matter was as nearly complete as it is possible to be, but most inportant of all, this simple and beautiful process notwithstanding all the forebodings regarding the high temperature in India, fermentation &c. works, when applied to cane in the tropics, just as easily, and without the use of any lime (excepting in the defecators) as when applied to beet in the more favourable climate of Europe. The water required for this process is nearly cent per cent on the weight of the cane, but the waste water (water used for presure,) can be utilized for condensing purposes, as it is of the ordinary temperature.

The whole secret of the process is the state of the knives which are simple enough in construction yet on their efficiency depends the quantity and quality of the juice as well as the *time* required for extraction.

A few remarks regarding the application of the Process to the Aska Sugar Works, and the disadvantageous circumtances under which it has been installed will perhaps not be out of place.

The factory was not constructed to work from cane, but, like most factories in India is a refinery for the native product or Goor.

I have adapted as well as I could the diffusion process, to my refinery, and with the view of doing so quickly, made my diffusions in the work of wood,—the disadvantage of wood is self apparent.

Having been hitherto merely Refiners we have not taken in hand cane cultivation, and consequently all the cane in our neighbourhood though of considerable area is of native cultivation, and in patches varying in size from one to twenty acres and at a distance of 2 to 20 miles from our works. All this cane, be it remembered, is planted within one month, and indeed fifteen days, as the first shower of rain is the signal for a general planting, the cane is therefore simultaneously ripe, and our time of work in consequence exceedingly limited.

The native irrigation is miserable, and the cultivation as a century ago, consists in scratching the ground with a *wooden* plough and manuring the plant with oil cake A German of scientific and pratical experience once remarked to me, that, one great cause of the success of diffusion applied to Beet was the superior cultivation of the plant in the present day, but we have now successfully applied it to a cane with the minimum of cultivation, and here it is of import ance to observe that in a dry season when the extraction by mills must be seriously diminished by diffusion, the percentage of extraction is not affected If then with cane so rudely cultivated and scattered over such an area, the transport of which to the works over a country without roads is attended with such delay and difficulties, these results have been obtained, what are the prospects of the scientific planter and sugar maker who may apply the process to his superior material grown in the immediate vicinity of his works, for the advantage of this process is not merely the extraction of more juice in a dry season, but the extraction at all times of 20 25 per cent more juice than ordinary mills, the purity of that juice over mill juice (see the analyses at foot) the saving in the cost of plant, and while the process is as simple as the present method of extraction and requres no more hands, its only draw back is the mingling of 10 15 per cent more water in the juice

In justice to Mr Robert, I must add, that, to his judicious selection of Mr Edward Karop who accompanied me to India I owe the instalment of the process in these Works, and the instruction of a staff of my Employes who at the close of another campaign will be well acquainted with the manipulation of the process and able to introduce it in other Establishments I shall shortly be in England to arrange for the disposal of the patent rights to those who may be desirous of adopting the process

(Sd) F I V MINCHIN

	Dry Extract of Sac chrometer	Water	Crystallizable Sugar	Glucose	Organic Substances	Salts	In 100 fixed substances are —					Total of Foreign Sub stances in 100 fixed substances
							Crystallizable Sugar	Glucose	Organic Substan ces	Salts		
Mill Juice	18 158	81 842	16 758	0 761	0 27	0 369	92 289	4 191	1 487	2 033	,	3 520
Diffusion Juice	14 808	85 192	13 625	0 723	0 190	0 27	92 011	4 882	1 283	1 824	„	3 107
Mill Juice	17 60	82 40	16 16	0 854	0 237	0 329	91 818	4 852	1 460	1 870	„	3. 33
Diffusion Juice	14 34	85 66	13 22	0 708	0 173	0 237	92 204	4 937	1 206	1 653	„	2 859

CALCUTTA BOTANIC GARDEN.

The Museum at Kew has lately been enriched by the receipt of a large and very valuable collection of woods, comprising sections of the trees blown down in the Calcutta Botanic Garden during the fearful cyclone which raged there in 1864, and the effects of which were noted in your columns at the time. From these specimens, obtained from 222 species, a better idea of the treasures of the garden in introduced and indigenous timber trees, and of the vast damage done by the cyclone, may be obtained, than from any information hitherto furnished by letter or otherwise. The specimens, which comprise longitudinal and transverse sections of most of the species, are all very carefully cut, polished, and labelled, the labels often stating the age of the individual tree, and the country whence introduced. It may probably interest some of the readers of the *Gardeners' Chronicle* to know something about these trees, which once beautified the Botanic Garden of India. Amongst those foreign to Indian soil, but which, judging from the size, age, &c., of the specimens sent, appear to have thrived there, the following occur :—

Guazuma tomentosa ; This is a native of the West Indies and South America, and belongs to the natural order Byttneriaceæ, and is called by the French colonists in the West Indies Orme d'Amérique, on account of its resemblance to the Elm, and by the English in Jamaica Bastard Cedar. The tree is valued in Jamaica for the shade which it affords, as well as for its leaves and fruits, of which cattle are very fond. The fruits and inner bark contain a quantity of mucilage, which is extracted and used as a substitute for gelatine. This mucilaginous property is said to be nutritious ; that the fruits when crushed form an excellent food for horses. The inner bark abounds in mucilage, and an infusion or decoction is given by native practitioners for the cure of cutaneous diseases. The wood is very light, is easily split, and is much used for the staves of sugar hogsheads. In India a fibre is obtained from the young shoots, the breakage weight of which has been proved at 140lb. when wet, and 100lb. when dry. The specimen of the wood from the Calcutta Garden measures 8½ inches in diameter.

Araucaria Cunninghami, the Moreton Bay Pine, is, as its name implies, a native of the shores of Moreton Bay, in lat 14° to 29° S., and is also found on the alluvial banks of the Brisbane River, in lat. 27° to 31° S. It grows in still greater abundance in the brush forests of the Richmond River. This graceful tree thrives best near the coast, often attaining in such situations a height of from 100 to 130 feet. It was discoverd by Sir J. Banks and Dr. Solander in 1770, but it was not till 1824 that the first living plant arrived at Kew. It was named by Aiton after Allan Cunningham, the celebrated Australian botanist and explorer. The wood is very even grained, and similar in appearance to the finer kinds of Pine, but some specimens are very finely marked with small knots, like Bird's-eye Maple, but of a lighter and more delicate colour. Its chief use in Queensland is for furniture and house-carpentry. It also makes excellent masts for vessels when green, but in drying the wood loses some of its strength, as there is little lateral cohesion between the fibres, and, unlike most of the Coniferæ, there is no resin present in the wood to strengthen them. Fine specimens of the wood, both from Sydney and Queensland, are exhibited in the timber museum at Kew. The specimen from Calcutta measures 7 inches across, and the age of the tree was 30 years.

Cæsalpinia Coriaria: This is a small tree, not more than twenty or thirty feet high, a native of the West Indies, Mexico, N. Brasil, &c.; and belongs, as its generic name indicates, to the natural order Leguminosæ. The leaflets are of an oblong linear form, and are marked on the under-surface with black dots, while the flowers, which are white, are arranged in branched racemes. The pods are very curiously twisted or curled, somewhat in the shape of the letter S. They contain a large quantity of tannin, and are well-known in commerce under the names of Divi Divi or Libi Divi. They are chiefly imported from San Domingo, Maracaibo, and Paraiba. The tree in the Calcutta Botanic Garden measured one foot in diameter, and was 29 years old.

Casuarina equisetifolia is a tree widely spread through the South Sea Islands, the Indian Archipelago, as well as the East Indies. It grows best, like the other species, in a damp situation; and it is known in Australia by the name of Swamp Oak, while C. quadrivalvis is called She Oak, and several other species Beefwood. These Casuarinas are very curious trees, having leafless, jointed, pendulous twigs or branches, bearing some resemblance to Equisetums, or Horsetails The young branches of some species have an agreeable acid flavour, and are readily devoured by cattle. The timber of all the species is very hard, of a deep red colour; and some species, as C. tuberosa, are beautifully marked. The wood of C. equisetifolia is called Ironwood in the South Sea Islands, from its extreme hardness; and it is much used by the natives for making their war-clubs, while from the ashes of the wood after burning a coarse kind of soap is made. Several species of Casuarina are in cultivation in this country as greenhouse plants, their singular appearance being their recommendation. The tree recently destroyed in the Calcutta garden measured 1 foot 3 inches in diameter, and was 20 years old

Cupressus sempervirens is the common Cypress of our gardens; it is a native of Persia and the Levant. One variety, C. fastigiata, sometimes attains a height of 50 or 60 feet, and is extensively planted in Southern Europe and Western Asia With us it is seldom seen more than 13 or 14 feet high, being a very slow-growing tree, and, moreover, liable to injury from severe frost. The variety C. horizontalis has a more spreading habit, and somewhat of the appearance of a Cedar The specimen from Calcutta measures 1 foot in diameter.

Colvillea racemosa is a native of Madagascar It belongs to the Leguminosæ, and is nearly allied the the genus Cæsalpinia; it is a very beautiful tree, having long bipinnate leaves, each leaf being composed of about 20 or 30 pairs of pinnæ, upon each of which are placed a similar number of opposite linear leaflets This delicate form of foliage gives to the tree a grceful Fern-like appearance, its beauty being still greater when the tree is in full flower, bearing, as it does, dense pendulous racemes, a foot or more in length, of bright scarlet blossoms. The tree grows to a height of about 50 feet in its native country. The Calcutta specimen was 24 years old, and measured 11 inches in diameter. The wood has no particular value.

Kigelia pinnata: This is a large tree, nearly allied to the genus Crescentia; it is found both on the western and eastern sides of Africa, in Mozambique, Nubia, Abyssinia, &c, and extends as far south as Natal. The tree bears panicles of large bell-shaped flowers, which are followed by peculiar oblong woody fruits, varying from 1 to 2 feet in length, and sometimes even longer, and about 5 inches broad; they are filled with a kind of pulp, and contain numerous seeds. These fruits hang from the tree upon stalks, usually 2 or 3 feet in length; they are used by the Nubians, after being cut in half and partially roasted, for outward application to cure rheumatism. The natives hold the tree sacred, and conduct their religious rites and ceremonies by moonlight under its shade. The wood is not, so far as I am aware, put to any use, except for making poles, which the Nubians erect before the houses of their chiefs, as objects of special veneration. The Calcutta tree was 30 years old, and the trunk measured 1 foot in diameter.

Canella alba: This plant furnishes the Canella bark of commerce. It is a native of the West Indies, and grows to a height of 50 feet; it has been placed by various botanical authorities in several different natural orders, but its proper place is now considered to be between Violaceæ and Bixaceæ, forming an order under the name of Canellaceæ, and including only Canella and Cinnamodendron. The well-known aromatic bark is used as a tonic, and in the West Indies the natives use it as a condiment or spice. The tree which grew in the Calcutta Botanic Garden, and of which a specimen is now in the Kew Museum, was 60 years old, and measured 7 inches across.

Swietenia Mahogani: The mahogany is a lage forest tree, native of Central America, Cuba, Honduras, Jamaica, &c., growing chiefly upon rocky soil; it produces a woody five-celled fruit, about 5 or 6 inches long, and containing numerous large winged seeds; these fruits when ripe dehisce by five valves, scattering their seeds abroad in all directions. The wood—the mahogany of commerce, is one of the most valuable of furniture woods, and forms an important article of import to this country, as many as 53,394 tons having been imported during the past year. In the mahogany forests of Honduras, immense trees rear their lofty heads, and spread their massive limbs, some, it is said almost too large to fell; the shining green leaflets and the clusters of small white flowers lend a charming effect to the forest scene. The felling and transportation of the timber to th coast is a work of some difficulty, owing in many localities to the close proximity of the trees to one another, and to the uneven nature of the ground Roads had formerly to be cut to allow of the lumbering timber truck to be moved at all. The timber is thus conveyed to the nearest stream and floated down to the coast. Some of the logs are of immense size; and it is said that a single one lies, or at least did lie, a few years since, near the south coast of Cuba, too heavy and bulky to be conveyed to a port for shipment: it was supposed to weigh about 18 tons, and measured 12 feet long and 9 feet broad. The first mention we find of mahogany is in 1597, but the wood was not imported into London for general use till 1724. Two sorts are known in commerce, namely, Spanish mahogany, which is imported from Cuba, Jamaica, and San Domingo; and Honduras mahogany, imported from Honduras. The former is generally of a darker colour than the latter, and is more strongly figured or marked. The specimen from Calcutta is a finely-marked one, but is light in colour; it is probably of the Honduras kind. The tree was 70 years old, and measured 3 feet in diameter.

Hymenæa Courbaril is the West Indian Locust-tree, and is the "Limini" of British Guiana. The leaves are composed of a single pair of leathery leaflets, whence the generic name from Hymen, god of marriage. The small, white, stalked flowers are succeeded by hard, woody pods, 5 to 6 inches long, and 2 to 3 inches broad, and contain several hard black seeds, imbedded in a kind of pulp. These pods are covered with innumerable minute warts, each of which appears on examination to be a mere exudation of resin, simply covered by the epidermis of the pod. A large quantity of clear resin—called "Animi" in British Guiana—is exuded from the branches and trunk of the tree, so that the entire plant seems highly charged with the resin. The trees grow in British Guiana to a height of 60 to 80 feet before branching, the base of the enormous trunks being supported by immense natural buttresses, which grow out from their sides. Martius says that some of the Brazilian Locust-trees are of such immense girth that 15 Indians with outstretched arms could scarcely embrace one of them. The wood is exceedingly hard, close-grained, and compact, of a brown colour, sometimes prettily streaked. It is occasionally used for furniture in the colony, but chiefly for mill-timber and engine work, on account of its great strength In the Calcutta specimen, which measures 1 foot 2 inches across, and was 59 years old, the wood is not so dense nor so close-grained as in native-grown specimens: this is more especially perceptible in the alburnum.

Melaleuca styphelioides is a tree growing to 80 feet or more in height, with alternate, ovate, or ovate-lanceolate leaves, and dense oblong or cylindrical spikes of flowers. It is a native of New South Wales, and is one of 97 species of the same genus, all natives of Australia. The wood is very hard, as in its neighbours the Eucalypti. The Calcutta tree was 16 years old, and measured 5 inches in diameter.

Callistemon salignus is a large shrub or small tree, native of Australia, distributed through Queensland, New South Wales, Tasmania, Victoria, and South Australia. The leaves are lanceolate, acute, from 1½ to 2 inches or more in length, and hang drooping from the branches, somewhat in the form of those of the Weeping Willow; it grows in moist situations. The timber is used in New South Wales for posts, as it stands damp well. The Calcutta tree was 31 years old, and measured 6 inches in diameter.

Eucalyptus resinifera: This is a tall tree, native of Queensland and New South Wales, and is known in different localities as Red Gum, Red Mahogany, Grey Gum, Hickory, &c. The wood is exceedingly hard and durable. The Calcutta tree was 46 years old, and measured 1 foot 3 inches in diameter.

Grevillea robusta is the Silky Oak of the Australian colonists; it grows to a large size, and is very general in the nothern districts of New South Wales. The wood is of a deep reddish-brown colour, beautifully marked with light stripes, and it would make an excellent furniture wood, if it were better known amongst our cabinet makers, and introduced in some quantity. Some splendid specimens of the wood are exhibited in the timber museum at Kew. The tree destroyed at Calcutta was 20 years old, and measured 1 foot 2 inches in diameter.

Hæmatoxylon Campechianum is the tree which affords the Logwood of commerce; it is a native of Campeachy, in Yucatan, and other parts of Central America, and is also now grown in the West Indian Islands. The tree grows to a height of about 40 feet, and has pinnate leaves, composed of four pairs of leaflets, and clusters of yellow flowers; the pods are very thin, pointed at both ends, and each contains two seeds. Logwood is esteemed one of the best deep red and black dyes, and is imported into this country in logs about 3 feet long, which are cut up into chips by machinery for the dyer's use: the heartwood alone is imported,—the alburnum, which is of a light colour, being previously removed; 28,530 tons were imported into this country during the past year. The tree destroyed in the Calcutta garden was a small one, measuring only 7 inches in diameter.

Sections of the following introduced trees are also in the collection now at Kew, but as the plants themselves have no important economic value, a mere enumeration will suffice. Of Mauritian and Madagascan trees are Fœtidia mauritiana: only three species of this genus are known, and all are natives of Mauritius and Madagascar; as also is Cossignia borbonica. Of West Indian and tropical American trees the following occur.—Citharexylum subserratum, Spondias lutea, Plumiera hypoleuca, Sapota Achras, Pithecolobium dulce, Triplaris americana, &c.

From the foregoing notes it will be seen that many of the trees were fine specimens of their kind. Amongst trees indigenous to the soil from which they were uprooted many were old, and very fine examples, a few of the principal of which I shall notice at another time.

Alstonia scholaris: A tree growing 50 to 80 feet high, widely diffused over India and the Moluccas. In the neighbourhood of Bombay it is known as the Devil Tree. The trunk is furrowed, and the bark is very bitter to the taste, and is used by the natives as a tonic. The wood is exceedingly light in weight, and white in colour, and is used in Ceylon for making what would appear to be very unendurable coffins. In Assam the trees grow to a very large size, and there the wood is applied to a multitude of uses, such as beams, trunks, boxes, floats for nets, &c. The genus is named in honour of Professor Alston, at one time Professor of Botany at Edinburgh, and the specific name is derived from the fact of planks of the wood being used in India as school-boards, upon which the children trace letters (with sand). The specimen from Calcutta measures 3 feet across. The wood of another species of Alstonia—A. macrophylla, Wall.—is also in the collection. it was 39 years old, and measures 9 inches across

Conocarpus acuminatus is a large tree, belonging to the natural order Combretaceæ. The wood is exceedingly hard and durable, and if used for work in a dry situation is almost equal to Teak; it is used chiefly for house-building, though it is difficult to obtain logs of sufficiently even growth. The specimen in the Calcutta garden was 61 years old, and measured 1 foot in diameter.

Careya arborea · This is a large tree, native of Southern and Central India The plants belong to the natural order Barringtoniaceæ, and has several economic uses. The bark is used for making a coarse kind of cordage, as well as for making a slow-match for the native firelocks for this purpose it is prepared and frequently enclosed in a coating of cotton, the cotton, often of more than one colour, being woven round it in a kind of pattern The wood, though strong and used for various purposes, as boxes, hoops, &c, is liable to split, more especially if exposed to the sun, it is very flexible, and was formerly used for making the drums of the Sepoy corps. The fruit is about the size of an Apple and has a peculiar and unpeasant smell; the fleshy calyces, however, are used in Scinde for curing colds. The Calcutta tree was 62 years old, and measured 7 inches in diameter.

Ægle Marmelos, is the Bhel or Bael of India, a tree growing to a moderate size, and belonging to the natural order Aurantiaceæ The tree is armed with sharp spines, and has white flowers, which are fragrant, and hang in panicles. The fruit is somewhat similar in form and appearance to an Orange, and contains a large quantity of tenacious transparent gluten, which becomes hard as the fruit dies. This fruit is very palatable and nutritious, and is sometimes used in medicine, sliced and preserved in sugar it is very nice, and in this form has been introduced into this country. The native builders obtain the mucilage from the seeds for the purpose of mixing with their mortar, as it gives it much greater tenacity. From the astringent rind of the fruit a yellow dye is obtained. The roots and leaves, and, indeed, nearly every part of the plant, has some reputed medicinal virtue; the wood is of little or no value. The Calcutta garden specimen measures 1 foot in diameter.

Sterculia urens is a native of India and Ceylon. The wood, like that of all the Sterculias, is soft and spongy; it is said to be used for making Hindoo guitars. The bark is very astringent; a gum resembling tragacanth exudes from it, and is collected for use by the natives who also use the seeds when roasted as a substitute for coffee, The tree in the Calcutta garden was 56 years old, and measured 9 inches in diameter. The wood of another species of Sterculia (S. fœtida), measuring 1 foot 3 inches across, is also in the collection. This tree, as its specific name indicates, has a most unpleasant smell, every part, when cut or bruised, emitting a strong odour.

Mangifera indica: The Mango grows abundantly in India, and numerous varieties are likewise cultivated for the sake of the delicious fruit. It grows to a good sized tree, The Mango is considered by some the best of all tropical fruits, but varies considerably, as well in flavour as in size, form &c., according to the variety to which it belongs; the inferior kinds, for instance, being woolly, and having a strong flavour of turpentine, while the best are mellow and grateful to the palate. In an unripe state the fruits are much used in India either pickled or made into a conserve The pulp contains sugar and gum, as well as gallic and citric acids. In times of scarcity the seeds are boiled and eaten by the Indians; both the seeds and leaves are said to possess medicinal properties. The wood of the Mango is soft, of a dull grey colour, but becomes deeper and harder as the tree gets older; it is used, along with sandal wood, by the Hindoos, for burning with their corpses The Mango is cultivated in hothouses in this country as an object of interest, and it has occasionally ripened its fruit with us. The diameter of the Calcutta tree was 1 foot 2 inches.

Acacia arabica: This is a tree growing some 30 or 40 feet high, probably yielding some of the gum arabic of commerce. The tree is armed with thorns. The gum is procured by making incisions in the bark, from whence it flows. The bark itself is used for tanning leather, as well as for producing a brown dye, and is called Babool bark; it is also used as a tonic medicine. The seeds and pods are used in the hot season when grass is scarce, to feed the flocks, and the timber is applied to various economic uses; in some districts it is considered the best for reducing to charcoal for gunpowder The other species in the collection are A. leucophlæa, from the bark of which the natives distil a kind of ardent spirit, and make cords and fishing nets of the fibre; A. Sundra, which yields a resin similar to that of A Catechu and A. dilatata. The former tree was 65 years old, and measured 1 foot 2 inches across, the second was 63 years, and measured 7 inches; and the last was 40 years, and measured 1 foot 6 inches.

Dalbergia latifolia is the Blackwood or East India Rosewood tree. It is a magnificent tree, and is common on the Malabar and Coromandel coasts The wood is in very great request for furniture and cabinet work all over India, and it is sometimes used for ordnance purposes. It can be obtained in planks as much as 4 feet broad, and this after the removal of the sapwood: it is very close grained and heavy, of a dark brownish purple colour. The planks, however, if not properly seasoned, have a tendecy to split in a longitudinal direction. Blackwood, nevertheless, is one of the most valuable woods of Southern India. The Calcutta tree was 56 years old, and the trunk measured 1 foot across.

Dalbergia Sissoo is another valuable Indian species, found further north than the preceding, and growing chiefly in Bengal and the provinces of the Punjab. It is a large and very beautiful tree and grows rapidly, producing a remarkably strong but light timber, which is used for a variety of purposes, as gun-carriages, ships' timbers, and even for sleepers on the Indian railways. The other species are D. lanceolaria, called Nedoon in Ceylon, producing a beautifully marked dark wood; the specimen of which was 37 years of age, ard measured only 6 inches diameter; and D. zeylanica, aged 63 years, and measuring 8 inches across.

FERONIA ELEPHANTUM: This is the Elephant or Wood Apple of India. It is a large tree, belonging to the Aurantiaceæ, and is common all over India, Ceylon, and Burmah. The fruit is about the size of a large Apple, with a hard woody rind, and contains a mass of pulpy substance, in which the seeds are imbedded. It is this pulpy portion of the fruit that is edible, and the natives make it into a jelly somewhat resembling black Currant. The leaves, when bruised, smell like anise, and the native practitioners use them as a stomachic and carminative. The wood is of a light colour, hard, and durable; from the stem, when cut or bruised, a gummy substance exudes, which is used in dyeing, and also for mixing with painters' colours, and by bricklayers in preparing a superior kind of white-wash. The Calcutta tree was 63 years old, and measured 6 inches diameter.

Ficus religiosa: This is the Pepul tree of India, common in all parts of the empire, and know by its long-pointed cordate leaves. It is venerated by the Hindoos, from the belief that their deity Vishnu was born among its branches. It is commonly planted near pagodas houses, &c. Silkworms are said to be very fond of the leaves, which are also used by the Arabs in tanning. Birds devour the fruits, and the seeds are thus frequently carried and dropped into cracks of buildings and other crevices, where they germinate and grow on, frequently causing much damage. The wood is light and useless, as is also that of F. artocarpifolia, which is likewise in the collection, and which was cut from a tree 31 years old, and is 8 inches diameter.

Dillenia speciosa : This is a tree about 40 feet high, growing in all parts of tropical India and the Malay Islands, and also largely cultivated on account of its handsome and ornamental appearance. The flowers, which appear at the same time as the leaves, are large and showy, having white petals and numerous bright yellow anthers, forming a brilliant globular mass in the centre of the flowers. The fruit is composed of a series of fleshy carpels, and is inclosed in a swollen and fleshy calyx, which is very acid, and is used for making jellies. A cooling drink, used in fevers, is made from the acid juice sweetened with sugar The large, hard, rough leaves are used for polishing furniture and tin ware. The wood is hard and tough, and is used to make gun-stocks, &c. Dillenia scabrella is, like the preceding, a very useful economic species, the fruits of which are used in a similar manner. The specimen of wood of the former received from Calcutta measured 1 foot in diameter, and was 69 years old, while that of the latter species was 54 years of age, and measured 1 foot 2 inches across.

Diospyros Ebenum is a native of Ceylon, and is the tree which yields one of the best sorts of commercial Ebony. Diospyros montana is a middling-sized tree the wood of which is variegated with dark and white viens. D. Embryopteris is called "Gaub" by the Hindoos. The fruit of this species is very astringent, and is used in tanning, and the viscid juice which it contains is used by the Indians for coating their fishing-nets for the purpose of strengthening them. The specimen of D. montana shows the tree to have been 61 years old, and measured 1 foot 4 inches in diameter. A specimen of D. ramiflora measures 11 inches across, and was 70 years old. D. discolor 7 inches across, and 53 years old ; and D. heterophylla, 7 inches across, and 37 years old.

Chloroxylon Swietenia : This tree yields the bulk of the Satinwood of commerce, grows to a height of 50 or 60 feet, and is a native of Ceylon, the Coromandel coast, and other parts of India ; the flowers, which are small, and of a whitish colour, are borne in large panicles at the ends of the young branches ; the fruit is a three-celled capsule, dehiscing by valves, and exposing in each cell four winged seeds ; the wood is so well known as to need no description. The satinwood of commerce is not, however, the produce of this tree alone ; much of it comes from the West Indies, and is yielded by an unknown tree. The specimen in the Calcutta collection measures 10 inches across, and was 63 years old.

Bassia latifolia the Mowah tree of Bengal, grows some 40 or 50 feet high, with alternate oblong or elliptic leaves, and small whitish flowers, which have a sweet taste, and are collected in abundance under the trees morning and evening during the season, for the purpose of distilling from them a kind of ardent spirit. It is said that in some parts of India where these trees abound every village has its shop for the sale of this liquor, which, when carefully distilled, and kept for some time, tastes very much like good Irish whisky; the fresh spirit on the contrary, is very deleterious, owing to the large quantity of empyreumatic oil which it contains; the flowers are likewise eaten raw. The seeds yield a large quantity of concrete oil, used both for culinary purposes as well as for burning in lamps. The wood is very strong and durable, and is much used for the naves of wheels, carriage work, &c The Calcutta specimen measures 1 foot 2 inches in diameter and was 64 years old.

Soymida febrifuga · This, the Redwood tree of India, grows to a height of 60 feet or more, and is the only representative of the genus. It has abruptly pinnate leaves, and the flowers, which are greenish white, are arranged in terminal or axillary panicles Its specific name of febrifuga is derived from the fact of the bark being used with success in cases of intermittent fever; it is also used as a brown dye. The wood is of a dull red colour, remarkably hard and heavy, and is considered by the natives the most durable of all woods, so that they mostly use it in the building of their temples. The specimen from Calcutta measures 1 foot 5 inches across, and was 77 years old

From the foregoing notes a pretty good idea may be formed of the amount of destruction wrought in the Calcutta Garden, as well of the value of the collection presented to Kew. I have only attempted to notice some of the oldest or most important economic trees, many possessing botanical or horticultural interest—such, for instance, as Jonesia Asoca, a tree of 70 years. and 1 foot 6 inches diameter—being necessarily left out, and when I repeat that the collection comprises 222 species, it will be at once seen that many more of great interest must of necessity have shared a similar fate *John R. Jackson, Kew Gardener's Chronicle* 1868—69

Correspondence and Selections.

AGRICULTURAL CAPABIILTIES OF THE HUZARA COUNTRY. COMMUNICATED BY G. LANDELLS ESQ.

IN promising you a few notes on my impressions of the capabilities of the country traversed by the Huzara Field Force in the Autumn of 1868, I was not without hopes that in the elevated valleys of that region, I should find all the conditions essential in the constitution of a good breeding country for horses, and these hopes resolved themselves into convictions in the course of my tour.

Having travelled over a great portion of Bengal, Bombay, Madras, Sinde, and a portion of Central India, and studied carefully the indigenous breeds of horses and the results of *crosses* with imported stock, whether Arab, English, or Australian, I come to the conclusion that there is at times a sad want of judgment evinced in selecting the parent stock. Even where the best judgment has been displayed, as in some of the Bengal Studs, the stock has not been equal to what might have been expected. There is a marked tendency to degenerate, and this is so strong that I should not expect really first class stock, if even sire and dam were both imported. The climate is evidently unfavourable to the maintenance of all the characteristics that are required to breed a really good Horse.

But during my wanderings in Huzara I could not help being impressed with the peculiarly favourable conditions which exist in some of the valleys such as Manserah, Puklee, Shinkian, Tikree, Konsh. Especially I have no hesitation in advancing the opinion that horses might be bred without any fear of deterioration from the parent stock ; nor do I know any place in India, where the quantity and quality of natural fodder and cheapness of grain present more favourable conditions for breeding regarded from a commercial point of view. Large paddocks might be enclosed, and with a few sheds raised on these, and water running through the paddocks, the horses might almost be left to shift for themselves. I would even venture so far as to assert that if the Government were to form a stud here, and select breeding stock, having all the essentials of a good Cavalry charger or Artillery horse, they might in a few years be able to supply the Indian Army with horses unsurpassed by any in the world. Many of these valleys, and in fact all the country from Koongulli to the Muchai Peak is admirably adapted to the raising of sheep and cattle. The Alpaca and Angora Goat would also thrive well. For sheep it would be necessary to make a careful selection from indigenous stock, and by crossing them with imported Australian rams, wool might be produced of almost any fineness. I had many opportunities of visiting localities at some distance from the line of march, and saw some fine grass. The soil from Koongulli to the top of the Black Mountain is a rich black loam, and should troops be stationed near, they might have the finest potatoes in India as the soil is all that could be wished for that purpose; some of the glades which I saw in their natural state struck me as being among the finest I had even seen, although I have travelled in other countries. I believe there are large flocks of sheep in those hills, from the marks I saw about several of the villages a little removed from the line of march.

That the hill people might at first be tempted to commit depredations upon stock raised in some of the valleys is probable, but if a heavy penalty for each offence were imposed upon the tribe, I think they would soon leave the Sirkar's property unmolested.

I examined some of the streams for minerals, and found a few Garnets, Amethysts, Crystals, also Antimony, Iron &c. I must here mention that on my return from Kaghan last June, I brought several goats with me and on arrival at Jaba about 14 miles from Manserah, I noticed two goats frothing at the mouth. I asked the villagers what was the cause of the animals suffering as they seemed to be in great pain; they told me that they would soon die, and that large numbers of goats and sheep died on the journey from Kaghan to the Huzara hills, through eating a shrub,—that none recovered. I had no mineral antidotes by me but knowing that milk, eggs &c. are at times efficacious in cases of poison I gave each goat about a quart of warm milk, both recovered; although the Natives laughed during the time the goats were having the milk when they saw the animals recover, they called out "Wa, Wa." I have some of the leaves of this plant which I have given to the Secretary of the Horticultural Society here for an opinion. I also noticed that the horses and mules suffered very much from the narcotic effect of the grass which was used the evening before they marched for the Muchai Peak. My horse required 3 men to steady him while marching, until the effect wore off; he was a hearty eater, and perhaps eat more than some horses. The grass is long, reedy and a dark green. Much could be written on the capabilities of Kaghan, its sheep, its goats crossing of the latter with the Angora goat, by which a most valuable fleece could be produced. I hope you will excuse the rough way in which these notes are laid before you.

CALCUTTA:
11 *January* 1869.

OBSERVATIONS ON THE FOREST SCHOOLS OF EUROPE, IN A COMMUNICATION, FROM H. CLEGHORN, M. D., CONSERVATOR OF FORESTS, MADRAS (ON LEAVE TO EUROPE), TO LORD CLINTON, UNDER SECRETARY OF STATE FOR INDIA.

My Lord, Edinburgh, May 15th 1868.

I have the honour, as directed by you, to report, for the information of Her Majesty's Secretary of State for India, that I left Madras on medical certificate on 27th October last, and reached Malta on 22nd November, where domestic circumstances obliged me to remain for three months. During this period, I occupied myself in examining the Islands of Malta and Gozo and received much cordial assistance from His Excellency Sir Patrick Grant, G. C. B., in my researches as to the physical condition of these islands.

From the absence of water and soil, there are very few trees, and I concur in the truth of Dr. Sutherland's remark,* "The great improvement required "everywhere, but particularly in the vicinity "of the barracks, is shade from trees; this "can only be obtained at considerable labour "and cost," as the soil consists of a thin covering of earth on soft sandstone. A good beginning has, however, been made in the public gardens of Florian, and several parts of Valletta have been successfully planted with beautiful trees by the late Governor, Sir J. Gaspard Le Marchant. The most thriving of these are *Pinus pinea*, *Cupressus sempervirens*, *Phytolacca dioica*, *Schinus molle*, and *Araucaria excelsa*.

Among the trees which appeared to thrive best at the Government garden of St. Antonio were several species of *Acacia* and *Eucalyptus* from Australia, the same species which have been successfully introduced on the Neilgherry and Pulney Ranges of South India, and which endure the great heat of the Punjab. I had subsequent opportunities of observing the same species flourishing in Sicily and in various parts of Italy from Naples to Genoa ; this is an interesting fact in acclimatization. These fines trees are cultivated in the open air, and it was lately suggested in the "Revista Forestale," a monthly periodical published at Florence, that they might be used with advantage for re-foresting the land at the base of the mountains of Sicily and Italy.

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* See an admirable account of the topography of Malta in his Report of the Sanitary Condition of the Mediterranean Station, Part II., 1863.

The timber for house and boat building in Malta is imported from Trieste and America, and charcoal is supplied from the oak forests at the base of Mount Etna, and sometimes from Greece.

My inquiries at Malta were of a non-official character, but before leaving I placed in the hands of Sir Victor Houlton, Chief Secretary to Government, letters to Major Beddome, my deputy in Madras, and to Dr. F. Muller, Director of the Gardens, Melbourne, in which supplies of seed were solicited, and a system of reciprocal interchange proposed. It will probably be best to obtain seed direct from Australia, as all that is collected in India is at present required for the railway fuel plantations.

I have also consulted Dr. Hooker, Director, Royal Gardens Kew, as to his ability to supply select trees for this Mediterranean station, and he has expressed his readiness, with the sanction of the First Commissioner of Her Majesty's Works, to give any assistance within his jurisdiction.

From Malta I proceeded to Sicily, and saw the Botanical Gardens at Catania, Messina, and Palermo. Near the last city, I visited an interesting school of agriculture, where the cultivation of Sumach and other economic products was being carried on. Colonel Yule, C.B., has kindly translated, at my request, a treatise on the cultivation of this useful tree (*Rhus coriaria*), which has been read at the Botanical Society of Edinburgh, and will appear in the Transactions I would venture to recommend that the paper be circulated in the Punjab and other parts of India, where several species of *Rhus* grow, and I would therefore, ask permission of the Secretary of State in Council to incur a trifling expense for woodcuts.

The following figures, obtained at the Custom House, show the export of Sumach from Palermo on which duty was paid in 1867 :—

Sumach in leaf, kilograms 2,323, 130, or, say, tons 2,282.

Sumach ground, kilograms 15,692,699, or, say, tons 15,413.

The climate of Palermo appears to be favourable for maturing seeds of many plants grown in North India, and an interchange of plants and seed has been initiated with the Calcutta Garden ; two large cases from Dr. Anderson arrived while I was there. It occurs to me that

it might be advantageous to the Horticultural Societies of India to obtain their supplies of seeds from a dry climate, nearly in the same parallel of latitude with the Punjab.

The state of the roads in Sicily is not favourable for transporting the timber from the pine and oak forests which clothe the slopes of Mount Etna. Firewood and charcoal are brought down in large quantities on the backs of mules for the supply of Malta and the adjoining islands.

Vast herds of cattle and goats pasture at certain seasons in these forests, and there is a brisk trade in carob beans, almonds, hazel nuts, walnuts, chesnuts, and other forest produce, yielding an annual revenue. Oranges, citrons, and mulberries are very extensively cultivated. Olives and prunes are planted at regular distances on the steep declivities, and bind the soil together with their roots. The climate permits of shady trees being freely introduced in land occupied for agricultural purpose.

In Sicily and Calabria there is a great extent of the manna ash tree (*Fraxinus ornus*). The following statement, abstracted from the returns in the British Consular office, shows the value of the drug exported during the last four years :—

—	United States.	Baltic.	France.	Great Britain and Colonies.	Italy.	Other Countries.	Total.
	£	£	£	£	£	£	£
1863	758	368	2,593	9,841	—	3,377	16,937
1864	1,377	1,500	4,446	10,048	100	5,259	22,720
1865	3,514	500	2,141	4,257	200	2,200	12,812
1866	4,079	1,500	2,384	4,354	300	2,258	14,875

The merchants concur in saying that the demand is falling off.

In Florence, by the kindness of the Hon. Mr. Marsh, Plenipotentiary of the United States, and of Signor Filippo Parlatore, Professor of Botany in the Imperial University, I obtained a copy of the "Manuale Teorico-pratico d'Arte Forestale," 1864, now used by all the forest officers in the kingdom of Italy, and also the Compendium of Forest Regulations published by the Minister of Agriculture in 1866. A careful study of these books shows that, though less attention has been given to sylviculture and to forest legislation in Italy than in

France and Germany, yet the scarcity of constructive material, and the destructive action of torrents, have aroused the attention of the Government, and the importance of a sound system of forest management is now as clearly recognized in Italy as in the neighbouring countries

Many landed proprietors, including Baron Ricasoli, are planting successfully, though not forming forests on an extensive scale ; and discussion has taken place in the Chamber of Deputies as to the replanting of denuded mountain tracts in Alpine Italy. The union of the Italian petty States under one government has rendered practicable the arrangements for conserving and restoring its unexhausted forests, but the state of the kingdom is not yet favourable for steady progress in this branch of legislation.

It may be noted that a monthly periodical has been published for six years, which contains many interesting contributions on sylviculture, and the "Bibliographia Italiana" comprises, among many others, the following recent works, which are specially worthy of perusal :—

Caimi, P. Memoria sull' importanza, e coltura dei Boschi.—(Milano 1857 8vo)

Cerini, G. Dei vantaggi che apporterébbe allo Stato ed alla condizione idraulica dei territori l'istituzione di Sociatá per l'impianto e conservazione dei Boschi.—(Milano, 1844. 8vo)

Meguescher, F. Memoria sulla migliore maniéra per rimettere i Boschi della Lombardia, &c —(Milano, 1859. 8vo)

An Italian edition of "Man and Nature," by the Hon. G. P. Marsh, is now in the press, containing an exellent account of all that is being done to improve the Maremma of Tuscany, and giving the history of the legislation of the former Republics of Venice and Genoa for protecting the forests of the Apennine and Maritime Alps.

I made the acquaintance of several Italian botanists and forest officers,* with whom a profitable intercourse may be kept up hereafter.

In Switzerland I had an opportunity of seeing the spring operations on the borders of the Lake of Geneva, where felling was being carried on and pine logs are stored in large quantity ; these are brought down from almost inaccessible positions by various mountain torrents. When the snow melts and the flushes commence, the logs are launched without loss of time, as in the intramontane districts of the Himalaya. The moving and sliding of the timber and the floating operations are very instructive.

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* Profs. Tornabene, Catania.
,, Todare, Palermo.
,, Inzènga, ,,
,, Cesati, Naples.
,, Pasquali ,,
,, D. Parlatore, Florence.

The wooded crests and high forests overhanging cultivated valleys are strictly preserved ; they serve as "boulevards" against avalanches and cataclasms, and this preservation has been found to be equally necessary in the deep chasm valleys of North-West Himalaya.

The communal woods around Berne and Geneva are treated with great care, but are not so rigidly and economically conserved as the State Forests in France and Germany.

In passing through France, I took the opportunity of seeing as much as possible of the Forest administration between Bâle and Nancy. At Nancy I spent six days, and had several conferences with Professor Henri Nanquette, Director of the Imperial School of Forestry, with M. Matthieu, Sub-Director, and the other Professors, who explained fully the system of training.

The institution was founded in 1824, and the buildings are now being reconstructed and enlarged. The students, 80 in number, live in the school, except the 10 foreign pupils—"externes :"

British	5
Belgian	3
Portuguese	2
Swiss	1
	10

who have private lodgings close by. All are under strict discipline, and except in the wearing of uniform, the foreign pupils conform to all the rules, of which there has been no infraction on the part of any of our young men. The Director spoke in a kindly manner of them, and with much satisfaction,* and said that they were fond of the work ; on the other hand, they are happy and contented, and allude to the "bonté" shown them by the Director and the professors.

In the general register of the "Ecole Forestière," stipendiary students occupy a fair position, Mr Pengelly stands the ninth in the whole school, which, considering that he has been studying in a foreign language, must be considered very good. From the reports of M. Nanquette, as well as from personal intercourse with the young men themselves, at Nancy, I feel sure that one and all will prove useful assistants.

I have derived great pleasure from seeing the French system of culture of woods, and the general management of large tracts of forest as it is practised in that empire. The different features of the aboriginal woods present many points of analogy with forests of Northern India, and it is instructive to note the careful investigation of the relation of the wooded surface to the water supply.

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* "Bien satisfait."

The manuals propared for the use of the Forest School are specific in their details, and are in every sense practical handbooks. We have not at present a sufficient stock of facts for the compilation of a forest manual for India, but the time is approaching when similar guides may be prepared with much benefit to the Department.

The only point in the training of the pupils to which I would draw attention is the Forest Code of France. The processes as to trespass and other forest offences, are very different from the provisions of the Indian penal code, or the Forest Acts which have been passed by the local Governments and Administrations.

Although the pupils cannot fail to derive benefit from the precise rules laid down, and from the habit of watching the cases tried, yet it appears to me that the French rules which are inculcated are more stringent than it would be desirable, or perhaps practicable, to introduce into India, where it is often difficult to obtain a conviction for forest offences under the mild provisions of the Indian Forest Act.

REPORT ON THE CAOUTCHOUC TREE IN THE DURRUNG DISTRICT, ASSAM.

BY G MANN, ESQ., ASSISTANT CONSERVATOR OF FORESTS.

Enumeration of Caoutchouc Forests. Geographical range of the Caoutchouc Tree.

THE India Rubber or Caoutchouc Tree *(Ficus elastica)* is found along the foot and in the low tropical valleys of the Himalayas, from the Mechi River or Nepaul boundary at 88° east longitude to the extreme eastern boundary of Assam 97° east longitude, as well as along the foot and in the low valleys of the southern mountains of the Brahmapootra valleys, *viz*, the Patkye Mountains, Naga, Cossyah, Jynteeah, and Garrow Hills, which countries favour the growth of this and other Figs, or Banyan Trees, by their moist atmosphere, and enable them to luxuriate and become the most conspicuous members of these often impenetrable virgin forests.

They are sometimes met with near villages planted for the sake of the shade of their spreading branches and exceedingly handsome leaves, but not with an intention to procure Caoutchouc from them.

In Assam, the latter was first manufactured and exported from the Durrung Districts, where it has attracted considerable attention for many years past; and it was from there it was first brought to the notice of Government that the trees were getting exhausted, and that many of the trees producing this valuable commodity had been destroyed through indiscriminate tapping by the men who made their living by it, and who were naturally encouraged in doing so by the person who had the privilege or monopoly of purchasing it

'The Caoutchouc forests in the Durrung District'

It is to the Durrung District, therefore, that this Report especially refers, although the observations and suggestions will apply more or less to the whole of the Assam Valley on account of the forest in which the Caoutchouc Tree grows, being all of the same description and the localities very similar

Khaling Booree Goma and Kooreeapara Dooars forests

Although the tree is found as far west as the Napaul boundary it is not abundant until east of the Bor Nuddy, which is the western boundary of the Durrung District, where it is common in the forests at the foot of the hills in the Khaling Booree, Goma, and Kooreeaparah Dooars, between the Bor Nuddy and Moora Dhunseeree Nuddy, and has been exported for many years from these forests, which extend over about 40 square miles, as well as from the low valleys of the Bhootan Hills immediately above them, and especially from the forests in the neighbourhood of the exit of the Noonaee Nuddy in the Khaling Dooar and the adjoining hills, and those between the Deemajang and the Rootah Nuddies

The privilege of collecting the Rubber in the Government forests between the Bor Nuddy and the Moora Dhunseeree Nuddy was sold to Mr C P Bruce, of Mungledye, for one year, from the 1st of May 1863, for Rupees 1,525, but the time for collecting was limited from the 1st of November 1863 to the 30th of April 1864 to prevent injury to the trees by over-tapping, and under the condition that he should plant 400 trees in the forests abovementioned to provide for the loss of trees through injury

In the following year, the privilege was sold for Rupees 1,012 to Kyahs in the Mungledye Bazar, who purchased about 2,500 maunds of Rubber, but had not the slightest control over the tapping of the trees, and encouraged the latter as much as in their power to obtain the largest possible quantity during the short time they held the monopoly of buying it, as consistent with their interest, without any regard however for future supplies, which was of most disastrous consequences, in as far as it induced the men who tapped and collected the Rubber to indulge in the most outrageous wholesale destruction of these valuable trees, by either felling them with axes, or, if this was too troublesome, to collect firewood and burn them down, so as to render the operation of tapping more convenient than it would have been had the trees been left standing, and several hundred magnificent trees were counted, in all directions, lying on the ground with cuts across their trunks and roots from 6 to 18 inches long, 3 inches broad, and a foot to 18 inches apart, and smaller cuts on the upper branches of them, by which all that they could yield was extracted immediately after they were felled, with an utter disregard for future wants ; whilst only three small trees were noticed alive during the inspection of the forests on the left bank of the Noonaee Nuddy at its exit from the hill, and the forests in the Kooreeaparah Dooar are but little better, so that at present there is absolutely no Rubber worth speaking of to be got from these forests, nor for centuries to come, unless the tree is re-planted, as its natural re-production is exceedingly slow owing to the peculiar way in which the Rubber Tree begins its existence, a description of which may not be out of place here, since it is also the cause of rendering the trees in their natural condition so difficult of access, and induced the men to act as recklessly as they did in collecting the Rubber.

Owing to the density of the forests and close undergrowth in them, the seed of the Caoutchouc Tree seldom, if ever, germinates on the ground, but usually between the upper branches of other trees, which peculiarity places the young Rubber Trees when germinating at once from 40 to 60 feet above the surface of the ground.

In this epiphytical mode they exist until their aerial roots descend the trunk of their original supporter and reach the ground when these roots increase rapidly in size and number, and soon are larger than the trunks of the tree on which the plant germinated, which is frequently enveloped and completely hidden under the roots of the Rubber Tree.

These aerial roots also descend afterwards from the branches of the trees, and were seen of 7 and 8 feet circumference, 20 feet distant from the main or centre mass of roots, which form the apparent trunk of the tree when getting older.

This centre mass of roots varies much in size according to circumstances, and has been seen when very compact, measuring 51 feet in circumference, and the crown of the same tree measured 180 feet in diameter.

A fine specimen felled and lying on the ground, and which had a single stem measured 16', 3" in circumference, 30' above the ground.

Travelling eastwards the next forests are those in the Chardooar,

"Chardooar Forests"

between the Moora Dhunseeree, or Rootah, Nuddy and the Bhoorolee River, which are very extensive, covering about 220 square miles, and have not been as recklessly handled as those noticed before.

In these forests, between the Beelseeree and the Gobhoroo Nuddies, Rubber Trees are found as far as sixteen miles from the hills, but as the distance from the hills increases, and the atmosphere in which the tree grows gets drier, the quantity of Rubber to be obtained from a tree decreases, and whilst, it is stated by the men who fetch it from the hills, that one tree is able to produce from 2 to 3 maunds, the men who gather it from the forests at the foot of the hills only get from 20 to 30 seers per tree, and if far away from the hills, only half that quantity is obtained, especially if the ground is gravelly or otherwise severely drained.

Still further east, after crossing the Bhoorolee River, are the Nowdooar forests, between the Bhoorolee River and the Behalee Nuddy, which are nearly of the same extent but drier than those of the Chardooar and covering about 200 square miles, still the Caoutchouc Tree is abundant, close to the hills and good Rubber manufactured in former years by Messrs Martin, Ritchie and Company, of Tezpore, was got exclusively out of this and the Chardooar, for which the above firm held the exclusive privilege of collecting for fifteen years, from the 1st of January 1852, free of payment, under the condition that Rubber should only be collected between the 1st of November and the 30th of April, and that yearly 200 Caoutchouc Trees should be planted 60 feet apart in the above forests to provide for losses of trees through injury done to them by the gatherers.

As before stated, these forests have not been worked so recklessly those before noted, and no trees were seen felled or burned down, still it is evident that every ounce of Rubber procurable was tapped out of the trees and it is said that the above firm discontinued the collecting of Rubber a year before their lease expired as no more Rubber could be obtained at remunerative prices, and this statement is quite borne out by the appearance of the trees which have not yet recovered, although three years have elapsed since the tapping was discontinued. East of the Nowdooar are the Chydooar forests, extending from the Behalee Nuddy to the Morramor Noe, covering about 125 square miles, and formerly belonging to the Luckimpore District, but now forming part of the Durrung District, in which the privilege of collecting Rubber from the 1st of April 1868 to the 31st of March 1869 was sold for

"Chydooar Forests"

Rupees 1,300, under the same conditions as it was sold in the government forests between the Bor Nuddy and the Moora Dhunseeree Nuddy

In the Chydooar, Rubber Trees are only found in the forest along and immediately at the foot of the hills, and even there, although not felled, they have been almost completely exhausted, so that the Rubber purchased here during the past year, which amounted to about 1,500 maunds, came chiefly out of the hills, where it is being collected by the Duphola Tribe The latter state that the Rubber Tree is found for about two days' journey into the hills, after which it disappears, which is much the same in all the outer hills right along the Himalayas.

How Rubber was hitherto procured and under what conditions

The Rubber in the Durrung District was, as before said, collected, or, more correctly speaking, purchased, by some person or persons, who either paid for this monopoly, or received it free under the condition that they would adopt and adhere to certain measures of guarding against the loss of trees through injury, and if these measures were judiciously carried out, or enforced by men who had had some knowledge of the requirements of the plants, some good might have arisen from those conditions having been inserted into the pottahs but, as six months tapping every year are quite sufficiant to kill the tree, if advantage was gained by doing so, it is evident that such a length of time is more than sufficient to exhaust the trees to the utmost extent, and more so than is consistent with the interest of Government, as well as with the interest of the population of a country, who were favored with the source of such a valuable commodity as the Caoutchouc

Furthermore, as the trees when planted could not have grown up unless some clearance for the admission of air and light had been made and kept open, and as in the few instances, when trees were planted, it was done where it suited the planters but not the Rubber Tree, the good intentions of the framer of these conditions are entirely without results at present, and, so far from trees not having been injured, they have been recklessly destroyed as stated above, or exhausted to such an extent that unless the time of collecting is much more limited, and some plantations are started to provide for future supplies, there will be no more Rubber procurable from these forest a few years hence, and the Rubber Tree will gradually disappear and valuable commodity be lost to the public, and the revenue derived therefrom to Government

Measures of protection of the Rubber Forests

Since the Rubber, if well manufactured, is equal, if not better, than the best similar substances yielded by "Castilloa" and imported from Mexico, or that obtained from Siphonia Brasiliensis and S. elastica from Brazil, and far superior to the Caoutchouc imported from the west coast of Africa, it should be worth protecting and planting the tree, and to endeavour to induce the manufacturers to produce a superior quality than they have done of late

Limitation of time for tapping the Rubber Tree.

The chief and the only measure of protection of the Rubber Tree is, that of limiting the time for tapping to a sufficient short period, so as to prevent it being overdone, as the export of Rubber can be controlled and checked to a great extent whilst it is almost impossible to check the tapping of the trees themselves in forests so extensive and dense in fact in most parts rendered impenetrable by "Calameal' "Smilax' and other climbers, "Pandanus' tree ferns, and other dense scrub surrounding the intervening swamps, so as to permit entrance only by following the elephants, and rhinoceros' paths

The localities where the India Rubber Tree grows best, and produces most, are far from any habitations, and more inaccessible than the rest of the forest

Under these circumstances, the only apparent chance of checking the overtapping of the trees is to divide districts into three or more divisions, and permit the working of them by rotation only.

The present exhausted state of the trees, and frequent and careful enquiry from people who engaged in the collecting of Rubber, has convinced me that the tree should not be tapped oftener than every third year, and then this should be only done during the three months, January, February and March, as suiting the operation of tapping and being at the same time convenient to the gatherers, as not interfering with their agricultural occupations

Thus the Durrung District might with advantage be divided into three mehals, as follows first, all forests west of the Bhorolee River, second, the Nowdooar forests, third, the Chydooar forests

Such an arrangement could not fail to prove beneficial to the trees and secure a permanent supply of Rubber, which, I presume, is the main object to be obtained, and as there is no doubt that half of the Rubber at present exported, if not more, comes from the hills beyond British Territory these precautions would influence also the independent hill tribes, and prevent them overtapping the trees in their territory, if they could not find sale for it

There is nothing to prevent these measures being carried out effectively by forest officers, especially if supported in starting by the Civil Authorities, who, through their Mouzahdars, could make this known very rapidly to the people in the District, who, beyond doubt, would soon comprehend the advantage accruing to themselves by the adoption of such a measure

The felling of Rubber Trees would have to be prohibited, and the pottah holder held responsible for any tree found felled in the Division, for which he holds the lease

The revenue realized at present would, of course, be considerably reduced for the next five years, which, however, would be equalized during the succeeding five years, whilst the trees would remain in good health

If the present system is continued, I am convinced that in less than ten years no revenue will be realized at all from this source

It may prove necessary, after more experience is gained, to limit still further the operations, but for a first measure I think to restrict the tapping to three months Every third year is sufficient to guard against the trees being exterminated, which they would certainly be, if tapping three or four times in the year was continued as at present

As the monopoly of purchasing the Rubber has been established already, the only people to be watched would be the native shop keepers in the bazars to prevent them purchasing during the period the Division, in which they trade, is kept closed

This object would to a great extent be attained by giving leases not for one year only, but for three or six years, which would induce the pottah holder himself to take care of his property, and is desirable, for other reasons to be noticed hereafter

Improvements of the forests by plantation

The improvements of the forests, as regards the Rubber Trees in them, can only be effected by planting of trees in situations where they are likely to produce the largest possible quantity of Rubber, and secondly, where young trees can be under control

The first object is to be attained by planting in the moistest localities, which have proved suitable for producing the Rubber easily and abundantly by the tree having been placed there in course of the natural distributions of plants, which is invariably the best guide in selections of this kind, and in the Durrung District especially only the forest at the foot of the hills are suited for such operations, and not the vicinity of stations and high roads where Rubber Trees have been planted hitherto

West of the Bhorolee River, the forest between the Deemajang and the Rootah Nuddies would be well adapted; and east of the Bhorolee River, the immediate neighbourhood of a long line of earth-work or stockade, known as the "Duphalaghur," and thrown up by the Duphala people in former ages, and now perfectly overgrown with forest running from the Bherolee River east in a continual line for about 216 miles right along the foot of the Himalayas to the Diphoo Nuddy, through the extensive forests of the Nowdooar and Chydooar, would be equally well adapted for this purpose.

The planting of Rubber Trees in these forests could best be carried on by opening out lines about 15 feet in width and planting the young Rubber Trees alternately on either side of the line at about 100 feet apart. If a continual line of this kind was opened out along the foot of the hills, not only the young trees could easily be overlooked, but such a line would also greatly facilitate forest conservancy measures in general, and the removal of timber and canoes from the forest to river banks, etc., over a large extent of country without a heavy expenditure.

The propagation of the Rubber Tree is the easiest imaginable, as every branch put in the ground will make roots and grow rapidly into a tree, if light and air are admitted to the spot by slight clearing or cutting down of the scrub covering it. This will render it an operation possible for the simplest mind to carry out, which might otherwise be unable to perform manipulations of a more difficult nature. Stock plants and nurseries might be kept up at very trifling expense near inspection huts, and from these vacancies filled up, or planting operations extended, as deemed necessary.

The small proportion of useful Timber trees in the forest, which is not more than 20 per cent. in the best parts of it, the want of water carriage for Timber from many of the forests, and the absence of local labor, where the inferiority of the Timber prohibits the importing of labor, are also important facts to render the planting of the Rubber Tree desirable

Assuming that a tree reaches its full size at fifty years without tapping, and would after that yield every third year one maund of Rubber, which would be collected, manufactured, and delivered in Calcutta at Rupees 15 per maund, and should realize the present price of good Rubber, *viz*, Rupees 35 per maund, it would leave a net profit of Rupees 20 per tree every third year.

Besides this, one maund of Lac may be reckoned on from every tree per year, which, if collected at its present rate, could be delivered in

Calcutta at Rupees 10 per maund, whilst it fetches 15 to 20 Rupees per maund there now, which is a clear profit of Rupees 5 at least per tree yearly.

All these figures are the very lowest, and the tapping the most cautious, still if the tree planted lives a second fifty years, which it is sure to exceed, it produces a clear profit of Rupees 320 for Rubber and Rupees 250 for Lac, which is more than any two Timber trees of fifty years each, which might be grown in that time, could equal

At present there are two kinds of Rubber manufactured by the natives, one in irregular shaped solid lumps or loaves, and about 16 to 20 ounces in weight, and the second kind in round balls, consisting of small particles of Rubber, tied together with their strips of it into a ball weighing about 12 to 16 ounces each

The yield of the Rubber forests

Of these two kinds about 2,500 maunds are brought yearly into the Mungledye Bazar, and I estimate an equal quantity into the Tezpore Bazar, although nothing accurate could be ascertained in the latter, as several gatherers had lately been punished for tapping trees against the order of Government, by which the collecting of Rubber had been prohibited since December 1864

In the Chydooar about 1,500 maunds were, as before stated, collected during the last year

The first or the loaf kind is collected from the lower parts of the stem and the roots where incisions are made, about 3 6 inches long and 1-2 inches broad and 1 2 feet apart, in a slanting manner, so that the juice which flows out runs to the lower point of the cut, where a leaf is doubled up in funnel shape and fastened either by a small wooden peg or partly inserted into the ground to receive the juice

This, if a sufficient quantity has been gathered to make one of the above loaves is boiled in one of the cooking utensils used by the gatherers, which is first partly filled with water, and as soon as this gets hot the juice is poured into it, and stirred round until it gets sufficiently firm to be carried about without being clammy or sticking together.

The second kind of Rubber is obtained from the upper trunk and branches of the trees where small incisions are made, and the juice that runs out is allowed to become firm, adhering to the cut or to the bark of the branch near the incisions, from where it is gathered as soon as it is sufficiently firm and tied together into the round balls which are exported.

This kind is occasionally brought loose to the market, without being tied together into the balls, which renders it, however, less convenient for carrying.

The Kyas in the Mungledye Bazar state that the latter kind formerly fetched the highest price in Calcutta, but at present the loaf kind is preferred and paid higher for.

Both kinds are very carelessly collected, and become either intentionally or accidentally mixed with sand, small stones, chips of wood &c., which has induced the Kyas in the bazar to pay highest for the cleanest and lightest Rubber.

At present the Rubber is being kept back by the Kyas as it does not realize good prices in Calcutta, which, however, must be more ascribed to the inferiority of the Rubber than the overstocking of the market.

The price paid for both kinds of Rubber varies from Rupees 8 to 12 at present, which low price, however, is paid by way of barter, as the men who purchase the Rubber first buy the Eudi, or Eri silk at Rupees 8 to 12 per piece, and afterwards exchange this with the "Duphalas" for a maund of Rubber.

The Rubber bought from the Kucharies is exchanged in the same way for other articles, such as cloth, salt, opium, knives, or money, as it may suit the seller.

The price this Rubber fetches in Calcutta varies from Rupees 20 to 40 per maund; but, if care was bestowed on the manufacture, it beyond doubt would fetch much higher prices.

The manufacture of the good Rubber exported by Messrs. Martin, Ritchie and Company, of Tezpore, was always kept a secret during the time they held the pottah; but as three different persons, who were employed by them in separate factories, gave me the same account of it—I presume it to be a correct one—and describe it here, as everything depends on the manufacture, and Rubber of superior quality well prepared realizes four times as much as the careleessly collected Rubber exported at present from Assam: and a knowledge of it may prove even of benefit in other parts of the world. As for instance, the West Coast of Africa, where large quantities of Rubber are procured in Corisco Bay and the Gaboon River by English traders, which Rubber realizes a comparatively low price, because nothing of the manufacture is known to the gatherers or purchasers either.

The above firm bought the Rubber only in its fluid state from the people who tapped the trees, and who either carried it in earthenware pots, or cane baskets made in shape of the former and lined with a coating of Rubber in which the juice is said to keep fluid for about a month

Rubber in this state was first purchased at Rupee 1-8 per maund, but soon rose to Rupees 5 for the best or thickest procured from the roots, and Rupees 4 for the next best procured from the lower part of the stem, and Rupees 3 for the worst, supposed to come from the upper branches of the tree and to have been mixed with the juice of other species of Figs and water

This was placed in large wooden boxes or bins, *measuring* about 6 feet each way, and partly filled with water These are sunk into the ground with an arrangement for letting off the water and juice, which separates from the Rubber after a day or two, together with earth, sand, and small stones which may be in the juice when put into the bins After four or five days when turning a dark colour, and the Rubber separated from the water rises to the top, but is still fluid, it is put into large iron pans of 4 to 6 feet in diameter and 2 feet 6 inches in depth

The latter are first partly filled with water, about double the quantity of the Rubber to be boiled, after which the boiling is commenced with slow fires, whilst the juice is being stirred round

When the Rubber collects together in one mass, and the water loses its milky white appearance and clears up, the Rubber is considered ready for lifting out with iron forks placed in presses of about 18 inches long and 12 inches broad by 3 inches high, in which all watery matter is pressed out of the Rubber, and shaped into compact slabs, which after this first pressing for about an hour or two is cut into two pieces of equal size, wheich are put into smaller and lighter presses, in which it remains one or two days until it is smooth and somewhat firmer, after which the pieces were boiled a second time for about one-quarter of an hour, which finishes the Rubber These pieces are then dried in the sun, and afterwards washed with a thin coating of lime and stored on shelves in a dry hut until packed and despatched.

As everything depends on the manufacture of the Rubber, an effort should be made to induce the pottah-holders to make a better kind of Rubber, which might be made a condition in their future leases ; and the pottah-holder in the Chydooar is anxious to do so if he can get a lease for a longer period than one year, which inclination deserves the greatest encouragement.

"Improvements in the manufacture necessary ' Longer leases advisable "

The simple method by which the Rubber is prepared in the Province of "Para" in Brazil, *viz.*, by pouring the juice upon moulds and drying it in the smoke of slow fires, is unknown here, and I think well worth introducing, unless some better method can be found out from the manufacturers in England.

As the quality of the Rubber is of such importance, and no doubt the revenue derived from this source would much increase, if it was only exported of best quality, I would suggest that the samples now sent should be forwarded to the Reporter on Indian Products, India Office London, with a view of ascertaining the value of this Rubber compared with that from other parts of the world, and by what measures the Rubber at present manufactured in Assam could be improved.

It is impossible to form any correct estimate of the number of trees likely to exist, but that they must be very abundant is evident from the large revenue realized, as shown below :—

Forest Revenue received on account of Caoutchouc from 1861-62 to 1867-68, in the Province of Assam.

Names of Districts.	1861-62	1862-63.	1863-64	1864-65	1865 66.	1866-67	1867-68.	Grand Total.
Durrung, ...	....	......	1,525	1,012	....	......	....	2,537
Luckimpore, ..	....	.. ..	12.142	6,583	16,030	2,950	2,000	39,705
Nowgong, ...	8	8	829-3	5	8	243	3,600	4,701-3
Total, ...	8	8	14,496-3	7,600	16,038	3,193	5,600	46,943-3

The importance of the produce will be apparent from the fact that in 1863 not less than 65, 649 cwt, of Caoutchouc were imported into Great Britain.

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TRADE IN SILKWORMS' EGGS IN JAPAN.

Every year a number of agents are sent out from France and Italy to purchase silkworms' eggs in Japan. They are principally representatives of the various *Comizi agrari* (agricultural societies) of the silk-producing districts in Italy (chiefly from Lombardy, Piedmont, and Trent). The agents from France are less numerous. The best grains are purchased by the Italians, and the inferior qualities are sold to the French, who naturally give a lower price. The grains produced in the province of Oschin are most sought after, and the best quality fetch as much as from five to six dollars per card, which contains, on the average, about 25 grammes, or rather less than an ounce. The average price for good seed, however, does not range quite so high this year; the price of good seed was from three to three and a half dollars per card The inferior qualities are sold as low as from one to two dollars, but do not find purchasers amongst the Italian agents. To guarantee purchasers in Europe each card is stamped by the European consuls in Japan. At the Italian consulate this stamp is gratuitous, while at the French a sum of one dollar per hundred cards is charged. Some of the representatives of Italian houses of good standing have discontinued having their cards stamped, as their signature is sufficient guarantee to insure the quality of the seed. The quantity of seed produced during the present year by agents sent out to Japan, and by the various firms established at Yokohama, for European houses, amounts probably to not less than two millions of cards, or more than double of that produced last year, the total exports from Japan in 1867 being 832,000 cards of seeds, of which 515,000 were purchased by Italian houses, and 317,000 by French; the total value being upwards of two millions of dollars. Yokohama is the great market for silkworms' eggs; a considerable quantity of seed is also obtained at Osaka, but of an inferior quality ranging in price from one to two dollars per card; this, however, does not find purchasers amongst the representatives of the Italian houses. The cards are packed in cases, which contain from 200 to 300, the most usual size being that which contains 200, weighing 18 kilogrammes. The cards are placed ten by ten in grooves, so as to have a small space between. Formerly the cases were closed hermetically, but now a tin plate, perforated with small holes, is placed at each end, so as to allow ventilation. In the island of Nippon there are twenty-one silk-producing provinces, the richest being Oschiri, and having an area of 2,500 square miles The total production of the twenty-one provinces is about 4,300,000 kilogrammes of silk, or 86,000 bales of 50 kils, each. This is nearly double the total production of France, and about equal to that of Italy and Spain together The principal market for Japanese silk is Kioto, situated about 30 kilometres distant from Osaka. The opening of the port of Yokohama, in 1859, to commerce, has had a most beneficial effect upon the silk trade in Japan, the price having increased 100 per cent., and the production at least 25 per cent. Up to the present time a preference has been shown by both the French and Italians, for the Suez route, for sending the seed to Europe. But since the establishment of the Transatlantic service between St. Nazare, Aspinwall, Panama, San Francisco, and Japan, there is every reason to anticipate that this line will be chosen in preference for the future by purchasers of seed The service will be fully organised by next season, with regularity in the arrivals and departures, and the length of time employed between Japan and Europe will in no way be increased, and, moreover, the voyage through the tropics will be lessened by twelve days, and there will be less fear of the seed suffering the effects of the tropical heat than there is by the present mode of transport, passing by the Chinese and Indian Ocean About 300 cases were sent *viâ* San Francisco last year, and arrived in Europe in perfect state. Another advantage in this route is the saving in freight on the Suez route, which now costs about 33 centimes per lb by the latter, and 28 centimes per lb by the former (*Journal of the Society of Arts* Dec 1868)

SPECIAL CATTLE FOODS

THE prominence acquired, by constant advertisement, for Thorley's Cattle Food, has led to the introduction of numerous compositions of a similar nature The latest of these is advertised as ' Nutritious Cocoa Extract for Horses and Cattle " This is a novel application of Cocoa, if the food is actually a preparation from the Cocoa tree Cocoa, as we all know, is exceedingly nutritious, and is becoming more and more a favourite beverage in this country Linnæus name of the genus of plants which yield the Cocoa of commerce—Theobroma, ought alone to recommend its use, since the word (which is composed of the two Greek words for god and food) signifies that the seeds are a fit "food for a god" Benzoni, however, who travelled in the 16th century, speaks of it as a drink "fitter for a pig than for a man" He does not however, say anything against its nutritive qualities The value of Cocoa as an article of human food, as we all know is very great, it contains a large percentage of fatty matter, starch, gum, and gluten, besides theobromine, which is its peculiar principle, and which contains a large quantity of nitrogen Baron Liebig indeed, says that theobromine is the most highly nitrogenised of all vegetable principles and, as such, is the most nutritious, and certainly amongst the best flesh-forming vegetable products If, then, Cocoa, which was formerly considered a luxury, but which has of late years become more generally used, can be imported, prepared, and sold for human food at 6d per lb, we do not see why the Theobroma should not produce a profitable article for feeding cattle We do not at all expect that the Cocoa seeds, or "beans" as they are commercially called, will ever be imported into this country for such a purpose But the question remains: What becomes of the fruits themselves—the capsules and pulp which enclose the seeds? Though we never heard of these fruits being untilised, or their properties tested, there can be little or no doubt that where the seeds are so rich in nutritive properties the capsule itself must partake in some proportion of the same properties, and it may be the source whence the new cattle food derives its name Even if the fruit contained every property of the seed in exact proportion, the fact of its being woolly and not so easily granulated, would prevent its use for human food, but it would be no reason why it should not be mixed with other articles for cattle food. There is no doubt that much of what is now considered the refuse of commercial articles might be turned to account in this direction. As an instance I may mention that long since the seeds of the Tea plant were brought to my notice as likely to produce a good nourshing food: this seed contains similar properties to Cocoa, but is very oleaginous, and would therefore be crushed and used in the form of cake. Other instances of plants which do not come under the designation of fodder plants may be found in the Carob, Locust, or St. John's Bread (Ceratonia siliqua, L.), the produce of a tree native of South Europe, the Levant, &c., where the pods have long been used for feeding horses, mules, pigs, &c. It is not till within the last 16 or 18 years that they have been imported into this country in anything like the quantity they are now. They are perhaps more agreeable in flavour than highly nutritive in quality, and belong probably more to that class of food called carbonaceous, or heat givers, the real flesh-forming, or nitrogenous matter, being contained in the small black seeds, which do not get properly crushed in the manufacture, and escaping mastication pass through the system entire.

The seeds of the Fenugreek (Trigonella Fœnumgræcum, L.) is another of a similar class of food as the above, and is the produce of a small annual plant native of the region about the Mediterranean, but now cultivated in India and most other warm countries; it is also occasionally grown in England, but the British climate is not suited to it. The principal use of Fenugreek now is as a condiment for flavouring cattle foods and rendering damaged hay palatable. Fenugreek powder also enters largely into the composition of those quack nostrums so frequently believed in by unintelligent grooms and horsekeepers. Amongst the Greeks and Romans Fenugreek had a high repute for medicinal and culinary purposes.

Amongst the oilcake series of cattle foods many additions have been made of late years; it does not appear long since oilcake was made almost entirely from Rape seed, then Linseed, after expressing the valuable oil which that seed contains, supplied, and continues to supply a quantity of that now consumed. Besides that made in this country, a large quantity of linseedcake is imported from abroad, chiefly from the United States. Cotton seed is another comparatively modern, but very important introduction to the oilcake series, as is also that of the Soy bean (Soja hispida, Mœnch), a small quantity of which was imported and recommended for use some few years ago, since which time little or nothing has been heard of it. The plants yielding these beans are extensively cultivated in tropical Asia, the seeds themselves being produced in small oblong two or five-seeded pods. The beans are similar in form to the common Kidney Bean, though not much larger than an ordinary pea ; from these seeds the well-known sauce, called Soy, is procured, by boiling them with equal quantities of barley or wheat then leaving the whole mass to ferment for a long time, after which salt and water is added, and the fluid strained. The residue of the beans thus treated is said to be highly nutritious, and to form an excellent cattle food. There are two varieties of the Soja hispida known, one yellow and the other green, and an analysis has shown that in the green variety a larger quantity of nitrogenous matter is contained than in the yellow ; thus, while the latter shows 36·089 per cent, the former shows 38·919 per cent. Besides the use of these beans in the manufacture of Soy, the Chinese cook them for consumption at their own tables. A sample of this bean-cake is in the museum at Kew, and from comparision with Rape, Cotton, &c., a favourable opinion might be formed.

A question has lately arisen as to the efficacy of giving horses treacle or sugar in their food ; there can be no doubt that both will help to produce a sleek, smooth glossy coat. We are so accustomed to look to our home produce for the food for our beasts, that any new source does not, perhaps, meet with such a welcome reception as it would were it destined for our own individual consumption, or for application in the arts or manufactures, we are therefore glad to see some prospect of Beetroot pulp having an efficient trial as a cattle food in this country.

The most stiking instance, however, of the introduction of foreign food, is that mentioned in a recent issue of the *Daily Telegraph*, where we learn that a vessel was unloading at Liverpool a cargo of 1000 tons of closely packed hay, grown in the Bombay Presidency. The writer of the paragraph referred to rather poetically suggests, that this novel article of import may probably taste of the fragrant Lemon-grass and Kus-kus plants indigenous to Indian soil, and imported to this country for perfumery purposes; if so, and the flavour is agreeable to English horses, our home-grown hay may become at a discount, our beasts preferring that of tropical growth to the produce of the English meadows. Whether or not this new import is the beginning of a regular trade remains to be seen. At the same time this, and those we have mentioned in the early part of this paper, point to some new sources from whence we may expect some day to derive benefits. *John R. Jackson, Kew.* (*Agricultural Gazette, Jany.* 1869.)

ON THE ECONOMICAL VALUE AND APPLICATIONS OF THE LEAF-FIBRE OF NEW ZEALAND FLAX (*PHORMIUM TENAX, Forst*). BY W. LAUDER LINDSAY, M. D., F. R. S. E., F. L. S, ETC.

Very various have been the estimates formed at various times of the economic value of the dressed fibre of the New Zealand Flax-plant. On the whole, I fear its value has been much exaggerated. The colonists have been in the habit of asserting, and on such excellent authority as that of the late Professor Lindley, that the fibre in question is more than double the strength or tenacity of ordinary flax and considerably stronger than Russian hemp; and they add, that the plant will yield in cultivation per ton at least a half more fibre than Russian hemp. But the truest criterion of its value is the actual price it fetches, or could command, in the British fibre-market. Nominal or estimated value is a most fallacious criterion, especially when the estimate is formed by interested colonial referees, or their agents or friends at home.

Now, the Dundee fibre merchants of the present day—its jute and flax importers and spinners—rank New Zealand flax only with jute and the cheaper and coarser qualities of fibre. Unless it can be introduced here at £10 or £15 per ton, they say* it will not compete favourably even with jute. The finest qualities of common flax are at present valued at £50 per ton; and by the difference between £50 and £10 we may measure the estimate that has been on the whole formed in Dundee of the market value of New Zealand flax. A colonial paper states that a Dundee manufacturer estimated some "half stuff, sent from Otago, as worth £20 per ton for some descriptions of matting."†

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* My special informant was one of the partners of the well-known house of Cox Brothers, of Lochee.

† 'Otago Daily Times,' March 20th 1867.

But isolated and individual estimates of such a kind are of little real or practical value. The Dundee spinners complain that New Zealand flax does not "tie," but this may be the result of mal-preparation, because strips of the green leaf "tie" admirably. On the other hand, some specimens of New Zealand flax were produced at the New Zealand Exhibition of 1865, from Napier, valued at £70 per ton. They were said to be as fine as Belgian flax, capable of being spun into the finest cambrics, samples whereof were also exhibited.* As the result of a series of comparative experiments with Russian hemp at £40 per ton, the writer in the 'Catalogue' (p 156) says, "there can be but one opinion as to the superior strength" of New Zealand flax. He found trawl warps for fishermen made of that fibre successful in riding out a gale, while those made of Russian hemp gave way "Samples" or selected specimens of the fibre used by him were valued in London at £33 per ton.

In the Auckland (New Zealand) market, flax dressed in its vicinity commands a market price varying from £30 to £50 per ton. In the Melbourne (Australia) market New Zealand flax prepared in Otago, in the Mills of Mr. Constable at Dunedin, fetches £25 to £35 per ton for "hay-lashing." There it competes with Manilla hemp, which fetches £35 to £40 per ton In Dunedin, the same locally-prepared flax-fibre brings 35*s.* per cwt. for mattress-making, while the plant is collected and laid down at the mill for 20*s.* per ton

That which really regulates or determines the market demand for New Zealand flax, however, is the *cost of its production.* Were this such that, adding the cost of freightage and the producer's and merchant's profits, the fibre could be presented to the British and other markets at a lower price than, or nearly equal price with, common flax, Russian hemp, jute, or Manilla hemp, it might hope to compete successfully with these at present cheaper and more abundant fibres. The cost of production has not hitherto, however, admitted of this. In the case of some, at least, of the samples of New Zealand flax shown at the New Zealand Exhibition of 1865, the cost of production *exceeded the market value,*—a circumstance, of course, ruinous to all hopes of its competing for the present with the fibres above mentioned. The Jurors of the Exhibition, indeed, express an opinion that New Zealand flax *cannot* compete with European flax; and they very sensibly and cautiously only venture the length of saying that it *should* successfully rival hemp for cordage and green cloths †

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* 'Jurors' Reports,' p. 119.

† Ibid. p. 114.

Nevertheless, New Zealand flax at one time formed a very considerable *export* from New Zealand. In 1831, this single item of export amounted to £21,000 in value; and in the same year a manufactory for the production of goods from New Zealand flax was established at Ormisby, Lincolnshire, though it was soon given up In 1855, the value of New Zealand flax exports was between £5000 and £6000; In 1865 it had sunk so low as £75; while in 1866 it rose again to £996, whereof no less than £949 went from Auckland, and only £1 worth from Dunedin. These exports are, of course, in addition to the quantity consumed in home manufactures, no proper estimate whereof can be exhibited. These extraordinary fluctuations have been determined by such circumstances as native wars; the gradual decrease of the natives from the diseases and other concomitants of civilization; gold digging; the introduction of jute, Manilla hemp, and other abundant and cheap fibres of a comparable kind; the inferior preparation of New Zealand flax by Europeans; the varying requirements of, and consumption in the colony itself; and the varying market demand for fibre of its class. Between thirty and forty years ago, New Zealand flax enjoyed in the European market a reputation which it has since apparently lost. There was a great demand for it, which was met by a corresponding supply, the Maoris engaging their women and slaves in the extensive cultivation of the plant and the preparation of its fibre.

Successive colonial governments seem to have had visions of future wealth and greatness springing from an extensive local manufacture of, and export trade in, New Zealand flax Hence they have endeavoured to stimulate the ingenuity and perseverance of settlers by offering substantial premiums for success in the preparation of the fibre from the leaf. Such rewards are, however, scarcely necessary; for, from the days of settlement to the present time, the anticipations of *all* classes of colonists as regards the future financial importance of the native flax have been of the most sanguine kind. Hitherto it has been popularly supposed that the chief obstacle to the easy preparation of the fibre for manufacturing purposes is the difficulty of separating the *gum* of the leaf; hence Government rewards have been virtually offered to the "discoverer of a method of clearing the flax of its *gum*." But, even at the present day, there is no unanimity of opinion as to whether this is really the chief or only difficulty of the flax-producer Constable, of Dunedin, a flax preparer, professes to separate the gum readily "by strong *chemical* solvents;" while Spey analyst to the geological survey of New Zealand, reports, as the result of a series of special experiments, that the difficulties in preparing flax-fibre for use are of a *mechanical*, and not of a chemical kind,[*]—that is to say, that specially adapted machinery is required, and not special chemical re-agents. For myself, I believe that difficulties of *both* kinds exist; and even were these successfully overcome, there remain many other "Obstacles to the Utilization of New Zealand Flax," which I have discussed elsewhere.[†]

So long ago as 1856 (December 20th), the General Government of New Zealand offered seven premiums, amounting in all to £4000,—the first or highest being £2000, the second £1000, and five of £200 each,—"to the person who shall by some process of his own invention, first produce from the *Phormium tenax* or other fibrous plant, indigenous to New Zealand, one hundred tons of *merchandise*."[‡] The competition was open till January, 1859. It was stipulated that there should be a *bonâ fide* sale of the merchandise in Europe at an advance of 20 per cent. on the actual cost of the article when landed at any European port,—that is to say, that there should be a demonstrable *profit on the cost of production and sale*. Subsequently, the Government of Canterbury offered a premium of £1000, with similar aims; while, still more recently, the Provincial Government of Otago advertised a bonus of £530 to the person or company that shall first produce, within twelve months, a ton of *paper* from *Phormium tenax*, or other indigenous fibre, *equal in quality and price to imported paper*.[§]

Partly as a result of these offered rewards, partly springing from the high opinion of the value of New Zealand flax entertained by the colonists themselves, the experiments[‖] made on the preparation of the fibre and its utilization in New Zealand itself have been legion. Patents innumerable have been taken out; money has been expended by thousands of pounds. Nevertheless, *no award of any of these attractive premiums has yet been made!* None of the host of experiments made, whether on the large or small scale, has yet come up, as respects market success, to the stipulated standard. *The history of flax-experiments in New Zealand is the history of a series of humiliating failures* The colonist is forced to confess that he has not yet equalled nor improved upon the results obtained by the Maoris by mere hand-labour, and processes of the most primitive kind. He has neither produced a finer fibre, nor has he succeeded in dyeing it with more brilliant or faster colours Superior processes of preparation have yet apparently to be devised; while too little attention has hitherto been given to the at least equally important subject of the *cultivation* of the plant, with a view to its yielding the best kinds of fibre. Hitherto the colonists' operations have been conducted almost exclusively on the *wild* plant; though, as has been already shown, the Maoris have long recognized the superior value of the produce of the *cultivated* plant. There is, however, this other equally cogent reason for *cultivation*, if it be proved that the produce is of sufficient value to warrant the necessary expenditure of capital: *the native Flax-plant is rapidly disappearing* before advancing settlement and agriculture, with their concomitant, the development of an *immigrant flora* Hence the fibre-supply must, at no distant date, if the demand grow at all larger, depend on the extent to which the plant is cultivated. The great anxiety of the settlers to utilize the fibre has arisen in connection with the apparent enormous waste of available material in the eradication of the Flax-plant from the soil, as a basis for agricultural operations, and its subsequent destruction by fire. But enough has been said, especially on the comparative advantages of using the *cultivated* plant, to lessen materially our regret that so much seemingly valuable fibre-stuff has been virtually squandered or neglected.

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[*] 'Jurors' Report of the New Zealand Exhibition of 1865,' p. 372.

[†] Proceedings of British Association, Section E (Economic Science), 1867. Seemann's 'Journal of Botany,' 1867, p. 341.

[‡] 'New Zealand,' by Stines, 1659, p. 33,—an essay to which the London Society of Arts awarded its silver medal.

[§] 'Jurors' Report of the New Zealand Exhibition,' p. 236.

[‖] Some notice of the earlier experiments in question, and of the causes of their want of success, will be found in Dr. Thompson's 'Story of New Zealand' 1659, vol. ii p. 260 Reference may also be made with advantage to a work on *Phormium tenax*, by John Murray, F. S. A., F. L. S., which possesses the additional interest of being printed on New Zealand flax made paper. I have not been so fortunate as to see a copy of this work, which would appear to be rare. A copy was shown in the 'New Zealand Exhibition of 1865, by the Hon. Wm. Colenso F. L. S., of Napier ('Catalogue,' p. 17). Details of the more recent experiments on the preparation of the flax fibre, along with the most trustworthy information regarding the growth of the Flax plant will be found in the 'Jurors' Reports of the New Zealand Exhibition,' p. 429. Reference may also be made to the section on "Fibrous Substances and Manufactures," in the same 'Report,' p. 112.

The recent New Zealand Exhibition at Dunedin, in 1865, appears to have assisted materially in revivifying, after such a series of disheartening failures, the interest of the colonists in the preparation and utilization of New Zealand flax The exhibition in question contained several most instructive suites of specimens illustrative of the products of *Phormium tenax*, and their economic applications. Of these, probably the most complete and valuable were the exhibits of the Messrs. Davis, of Otaki, Wellington;* my friend Walter L Buller, F. L. S., of Rangitiki, Wellington, also showed an excellent series of flax fibres, hand-prepared (scraped by mussel-shells*) by the North Island Maoris for the manufacture of their mats or cloaks.† These exhibits prove that the Maoris are still the best flax-dressers in New Zealand; no machinery, no chemical manipulation of the skilled or educated European, is yet able to compete with the hand-labour and the mussel or cockle-shell of the primitive native. It is indicative of the firm, unshaken faith of the colonists in its value that, notwithstanding a continuous series of failures and disappointments, experiments continue to be made, and capital sunk, in the attempt to render New Zealand flax applicable to the manufacture of cordage, textile fabrics, and paper. The failures in question have mostly happened in the *North* Island,—a circumstance that seems to inspire with hope the experimentalists of the *South* Island, for several of the most recent essays have been, or are being, made in the southern provinces of Otago and Canterbury. Not only so, but the northern colonists appear equally undaunted. A flax-mill was erected in November, 1866, at Whangamarua, Waikato, in the midst of a country as yet wild and abounding in flax-swamps; and various similar efforts have been made from time to time in the province of Auckland. Nay, even at home there are still enthusiasts found to engage in the manufacture on the large scale of New Zealand flax produce. In the 'New Zealand Examiner' of June 13th, 1863, there is an advertisement or prospectus of a "New Zealand Flax, Hemp and Cordage Company, Limited," to work the patent of Lieut.-Col Nicolle, in Jersey. It does not appear whether, in this case, the plant operated on is grown in Jersey, or is imported from New Zealand, for it thrives vigorously as a hardy plant in our Channel Islands. Among the most recent local experiments, are those of Ed. M'Glashan and W. S Grieve, in Dunedin, Otago, in March, 1867, on the applicability of New Zealand flax to Paper-making. A New Zealand manufactory was also recently established at Christchurch, by A Cameron, who exhibited specimens of his "half-stuff" in the New Zealand Exhibition of 1865. Flax-mills have been of late erected in Otago, by Mr. Constable, at Pelichet Bay, Dunedin, and by Mr. Mansford on the Cluthe, Port Molyneux. The former mill was, in June, 1867, examined and reported upon on behalf of the Otago Government by my friend J. T. Thomson, C. E., the provincial engineer: "The manufacture," he says, "I consider a complete success." Constable's mill turns out 3 cwt. of fibre per day, and can produce 30 cwt. per week. The epidermis and gum are separated partly by chemical, partly by mechanical, means; the resultant fibre is said to be of excellent quality, and to *promise* to be marketable at a moderate price.* But, alas! similarly favourable reports have been made over and over again as to New Zealand flax, and yet it has no permanent place in the fibre market. Time alone can show how far, in this instance, these promises will be performed,—whether these anticipations are not, like so many of their predecessors, doomed to disappointment.

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* 'Exhibition Catalogue,' pp. 75 and 125

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* Apparently the *Mytilus canaliculatus*, Martyn (Dieffenbach, vol. ii. p 258). Other authorities describe the Cockle (*Cardium* sp ?) as the shell used. I found both shells abundant in all parts of New Zealand. They are common in the numerous "shell-mounds" that are distributed on its coasts. In all probability, sometimes the one shell, sometimes the other, is or was used in different districts and by different tribes.

† 'Exhibition Catalogue,' p. 25.

Applicability to the Manufacture of Cordage.—The value of New Zealand flax as a material for cordage, has been better tested and longer established than its applicability to the manufacture of textile fabrics or paper. E. W. Frent, of Brooksby Walk, Homerton, rope and twine spinner, exhibited specimens of the dressed flax and of rope, twine, etc., made from it, in the International Exhibition of London, in 1851; and in 1863 he gave much information as to its use in rope spinning, especially in contrast with Russian hemp, in the 'New Zealand Examiner' (Sepember 15th, p. 207). It is suitable especially he says, for bale-rope and bolt-rope. He regards it as unfair to employ the same processes of manufacture as in Russian hemp. He establishes, indeed,—apparently satisfacterily,—the strength and usefulness of the fibre, when properly prepared; but the question of *cost of production of a marketable article*, such as to leave a profit and still be under the price of European hemp and flax, is still left—by such experiments as his—as *the* great question for determination by the colonist. Thompson regards Constable's Dunedin fibre as equal to Manilla hemp; he anticipates it will compete with Manilla in the manufacture of the better qualities of rope in the Melbourne market, where the expected demand for this class of fibre for cordage alone is ten tons per week. The New Zealand Exhibition of 1865 contained an instructive suite of samples of cordage made from New Zealand flax, from the coarsest ship-rope to the finest thread, including clothes-lines, fishing lines and nets of twisted flax-fibre, and twine. Ships' cordage is reported to be excellent as to strength, but it does not absorb tar freely. For cordage, especially, it is still supposed that the New Zealand flax fibre is deteriorated by the *gum*, from which it has hitherto been found impossible altogether to free it. A New Zealand flax ropery once flourished in Auckland, but its operations were stopped by the irregularity of the supply of the fibre consequent on the native rebellion of 1863. Excellent ropes were shown in the International Exhibition of London in 1862, by Auckland patentees (Messrs. Purchas and Mimis) New Zealand flax made cordage is now largely used in the North Island, both by settlers and Maoris

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* 'Otago Daily Times,' July 27th, 1867.

Applicability to the Manufacture of Paper.—B. M. Cameron, of Edinburgh, the editor of the 'Paper Trade Review,' and himself both a paper manufacturer and an ingenious experimentalist, reported very favourably of New Zealand flax-made paper in a letter to the 'Times,' in September, 1863. He describes it as "superior, both in strength and capability of finish, to that made from most of the rags now used From experiments I have seen made...I am convinced there is not a better material to be had for the purposes of the paper maker." On the other hand, the Chevalier de Claussen, in his experiments on the fibres suitable for paper making,—the results whereof were laid before the British Association in 1855,—found that the fibre of *Phormium tenax* was both expensive to prepare and nearly impossible to bleach.* The paper on which Murray's work is printed is described as resembling that used for Bank of England notes; in colour it is, however, brownish, and in texture coarsish, containing a considerable number of specks,—both the result, perhaps, of defective manufacture and bleaching. The paper in question was, however, manufactured in England from New Zealand flax sent home; and paper made also in England so lately as 1866, from fibre prepared by M'Glashan and Grieve, has apparently similar characters. The latter paper is described in the colonial journals as "rather highly coloured," with a "singularity of texture," a toughness or tenacity, which suggest its use in documents intended to stand great wear and tear.† Hence it is expected to become "a very excellent paper for bank notes and other special purposes; while the paper, as sent from Britain, would assuredly become an article of commerce, supposing that the *cost of production* is not excessive" The New Zealand Exhibition of 1865 contained various samples of native flax-made paper, and of books, etc., printed thereon, as well as "leaf-stuff," or other stages in the conversion of the half-fibre into paper. In 1859 an attempt—apparently unsuccessful—was made to establish in Wellington a manufactory of paper from New Zealand flax (Stone's); and we have already seen that a paper-mill of a similar kind has recently been erected in Canterbury.

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* 'Athenæum,' September 29th, 1855, p. 1123.

† 'Jurors' Reports of New Zealand Exhibition of 1865,' p. 124.

I believe the colonists entertain exaggerated ideas of the value of New Zealand flax as a paper material. There is no sufficient evidence that paper manufactured in English paper mills, from selected samples of dressed fibre, possesses the qualities required in ordinary paper, and even were it proved that the New Zealand flax-made paper is of greatly superior quality to that produced from rags or straw, which are waste materials, and necessarily both abundant and cheap, or from esparto, which is also cheap in Europe,—the important question of the comparative cost of production of paper pulp, or "half-stuff" from New Zealand flax, remains unsolved. It is obvious that unless "half-stuff," or some equivalent from New Zealand flax can be introduced into the European or Colonial market at a price lower than that from rags or straw, it has no chance of successfully competing with the latter as a paper material. The use of dressed fibre is evidently rendered impossible by its great expensiveness, but the event of its utilization in large quantities in the manufacture of cordage or textile fabrics, the waste or refuse, such as refuse tow from the hacklers, or the waste of rope-spinning, might become available locally for some classes of paper. The jurors of the New Zealand Exhibition of 1865 suggest that it would be more profitable to export, for manufacturing purposes at home, the New Zealand flax fibre, half prepared, and that it might with greatest hope of success be used in combination with other less strong or coarse fibres. All such anticipations or suggestions are, however, premature, till it can be shown that the quality, on the one hand, and the cost of production on the other, entitle New Zealand flax to a sure footing in the fibre market.

Some years ago, at a time when there was considerable agitation in Britain, on the subject of scarcity and dearness of paper in the European market, and when the 'Times' had offered a premium of £1000 to any enterprising experimentalist, who should introduce a new marketable material,—a successful competitor (especially as regards price) to rags, I was led to study the subject of "substitutes for paper material." My inquires brought me into correspondence with Charles Cowan, M. P., of Valleyfield Paper Mills, and Robert Craig, of Newbattle Paper Mills, both near Edinburgh; R. M. Cameron editor of the 'Paper Trade Review;' Thomas Routledge, of the Ford Paper Works, near Sunderland,—the introducer, of "esparto;"* P. L. Simmonds, author of works on 'Waste Products,' and the 'Commercial Products of the Vegetable Kingdom;' the late Professor Henslow, of Cambridge; Dr. Hooker, of Kew; M. C. Cooke, of the India Museum, and other eminent authorities on paper manufacture or paper material. Among other results I was somewhat surprised to find that the amount of non-utilized material, quite equal in value, I believe, to New Zealand flax as paper stuff, is enormous, Fibres suitable for paper-making, as well as for the manufacture of cordage and textile fabrics, abound in all parts of the world, that are characterized to any extent by higher vegetation, especially in all tropical, warm, or temperate climates. Many of the British Colonies are hence most prolific, especially the East and West Indies, Mauritius, and Natal. All these colonies, however, have this advantage over New Zealand, that labour is abundant and cheap,—that of negroes, coolies, Kaffirs,* or other natives of the tropics, being largely available in all of them. These colonies are, besides, nearer England, and they have many other advantages over a distant young colony. From all which it follows, that there is little likelihood, I fear, of New Zealand flax competing with other fibres as a paper material, unless in the local market.

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* Mr. Routledge writes me (March, 1866) that his sales of "esparto" during the preceding year, had been over 30 000 tons. No other material is used in the Ford Works, and it is now also largely used by almost every paper manufacturer in Scotland.

Other Economical Applications of the Fibre.—In the New Zealand Exhibition of 1865 there was shown a complete series of flax-made fabrics from the coarsest to the finest, including railway cloths, sail cloths, canvas, duck, twill for cavalry trousers, and cambric; but such specimens have a very limited value; they show what can be made of New Zealand flax, under certain exceptionable circumstances, but they do not exhibit the cost of production. In point of fact, such specimens can only be regarded as "fancy" articles "got up" for exhibition,—mere curiosities of local ingenuity and industry. They have been for the most part, manufactured with great care from fibre dressed with great labour and at great cost. Articles similar to the samples could not be produced at prices nearly equal to those of jute or hemp. Briant regards New Zealand flax as suitable for coarse bagging, corn-sacks, wool-sheets and bands, hop-bags, and similar articles, which, however, in this country at least, can be made infinitely more cheaply from jute, even though the latter is itself at present somewhat dear. The "tow," or refuse flax, from cordage-making (in the form of an awled fibre like "corn") has been found suitable for stuffing mattresses, sofas, and chairs; and for this purpose it has been largely used in the North, and is also coming into use in the South Island. It has been found to preserve its elasticity for ten years. The fibre, or "prepared leaf," is used by the Otago settlers for caulking canoes and boats (coples). In the North Island especially, the fibre is still, to a considerable extent, manufactured by the natives into rugs, floor-mats, cloaks, and other articles of dress, or house furnishings, which are used equally by settlers and Maoris.

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* In the south island of New Zealand there are very few natives, about 2200, in Otago only 500, and in the north where there are still 53,000, their labour is much more valuable than that of negroes or coolies.

Properties and applications of other products and parts of the New Zealand Flax plants.—The foregoing do not by any means represent all the economical applications of this most useful plant. Indeed, in pre-colonization times especially, it was to the Maoris what the Cocoa-Nut Palm is to the Singalese and Pacific Islanders, the Bamboo to the Chinese, or the *Thuja gigantea* to the Indians of British Columbia and Vancouver.

The green leaf, torn into strips of varying size, subserve an infinity of uses, in lieu of cordage especially.

The shafts of the gold mines in some of the Otago diggings are built by a method "as instructive as it is novel, consisting of a framework or skeleton lining of timber, interlaced or plaited vertically and horizontally with New Zealand Flax."* The timber used is the small or "scrub" timber, in many places comparatively abundant, and hence inexpensive. The flax leaf not only binds together the timber supports, but prevents the loose or "detached stuff" from falling on the miners while at work. With thongs of the same kind, in pre-colonization times, the Maoris lashed together the framework of their wheves and the palisades of their pahs. The settlers of the present day use strips of the leaf—of various breadth, according to the strength desired—in lieu of all forms of thong and cordage, straps, or other fastenings, *e.g.* as stock-whips, ropes, straps for conveying loads on the back, after the fashion of knapsacks (these flax-straps being known to the Maoris as "kohaki," or "kawe"). The drayman, or stockman, as he goes along, improvises the strong pliant fibre of the green leaf into a variety of useful articles; and I have myself, in the form of flax-straps and in other shapes, repeatedly experienced its utility. The Maoris make baskets, or "kits," of the split leaves, dyeing them with "hirau" or "inau" bark (*Elæocarpus dentatus*, Vahl). These native-made baskets are in great demand among the settlers. About Auckland I saw them constantly in use for the conveyance of fruit and vegetables, especially of the peaches,† which are there so common in Maori cultivations. The generic name of the New Zealand Flax plant—"*Phormium*"—is said to be derived from this economical application of its leaf, viz. φορμὸς, a wicker basket, but the same term signifies also a mat, and a seaman's cloak made of coarse plaited stuff; so that, as regards the economical applications of the plant products, the generic name seems to have been appropriately chosen.

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* Vincent Pyke. Gold Field's Report for 1863.

† Ripe in February, 1862; the usual substitute there for apples in tarts and stews.

The dried flowering stem is not only largely used both by settlers and Maoris for walking-sticks (I have so used it myself), but it was at one time commonly used by the Maoris in the construction of rafts,—known to the South Island native as "mokhi"* (Haast),—especially in localities where large forest-timber for canoe construction was absent. In the Chatham Islands, where there is now no such timber, flax-stems are still so used, lashed together by thongs of flax leaf or by "bush-ropes"† of some kind. Rafts, or canoes, or "catamarans," are still occasionally improvised by travellers or explorers in primitive parts of New Zealand, *e. g.* by Haast, who reports constructing "catamarans" of dead trees when flax-sticks were not obtainable. The same dried flowering stems are still employed by the Otago Maoris in the construction of eel-pots ("punga") for snaring eels in the larger rivers I remember accompanying my friend Mr. Shaw, of Finegand, to a Maori village on the lower Clutha, for the purpose of giving an order for the construction of a couple of eel-pots. The wooden war-clubs of the Maoris were occasionally ornamented with dyed flax. The essential feature of the "tauno" mat was flax strips, dyed, but not otherwise prepared, it was held in great estimation as being quite impervious to rain.

A gummy or gluey matter pervades the plant,—most abundant, however, at certain times and in certain parts. It exudes naturally from the cut leaves, and is also artificially separable. The settlers describe it as secreted by the base of the leaf (or leaf-sheath,) and it was certainly there that I found it myself in any quantity. The gum in question resembles gum arabic in some of its properties, and as a substitute, therefore, it is used by the settlers.

It becomes invested with a high degree of interest in connection with the preparation of flax fibre; for to it all testimony has hitherto concurred in ascribing the main difficulty in the separation and utilization of the latter. This gum also bears the reputation, some parts of the colony, of being poisonous to cattle.* Were the New Zealand Flax plant extensively cultivated for the sake of its fibre, it is probable this gum might be separated and utilized.

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* Williams defines "moki" (or "mokhi," East Cape dialect), as a "canoe made of flags' or 'rushes'," so that other materials than flax-sticks (though their exact character does not here appear) are sometimes apparently also used in their construction.

† Climbers or creepers on forest trees, species of *Rhipogonum, Parsonsia, Rubi, Plagianthus, Metrosideros, Clematis.*

The flowers secrete a watery honey, a familiar dainty of the settlers, of all ages, of some of which I have frequently partaken while wading in the flax-jungles of Otago. On the first evolution of the flower, the large tubular perianth is found full to the brim of a clear, sweet fluid; at the same time the anthers are most copiously discharging their pollen,—so that the faces of the juveniles or adults who drain the flower-cups by direct application of their lips, generally bear the marks of that procedure in the yellow pollen-dust which adheres to their eyebrows, or besmears their faces. The plant contains 1 to 1¼ per cent. of Grape sugar, as well as a pure intense bitter principle; and these, when a strong infusion is subjected to fermentation (additional sugar being supplied) with yeast, yield a kind of bitter beer (Skey).† The bitter principle, the same chemist further suggests, might be used as a substitute for hops in communicating a bitter flavour to ordinary beer.‡

The root is said to be purgative, diuretic, sudorific, expectorant, and to possess the properties of sarsaparilla (Buchanan). So lately as December, 1862, I find it recorded in the 'Tarawaki Herald,' that for a virulent epidemic of small pox at Kawhia on the west coast of Auckland, and Mokau in Taranaki, the native doctors were using with success an ointment made by boiling the root-ends of flax leaves to a pulp. The seeds, also, are said to have been used medicinally by the natives. (*Seemann's Journal of Botany*, 1869).

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* *Vide* my paper on "The Toot Plant and Poison of New Zealand," Brit. and For. Medico Chirurg. Review, July, 1865, p. 176.

† Jurors' Reports of the New Zealand Exhibition of 1865, p. 433

‡ Ibid.

Monthly Proceedings of the Society.

(Monday, the 21st January, 1867.)

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Monthly Meeting having been read and confirmed, the Members proceeded, in accordance with the Bye-laws, to the election of Officers and Council for the current year. The President nominated Messrs R. Blechynden and Arthur Mowbray to act as Scrutineers, who reported the result to be as follows:—

President—Mr Arthur Grote.

Vice-Presidents—Messrs. W. Stalkartt, J. A. Crawford, S. H. Robinson, and Cowr Harendra Krishna Roy Bhahadoor.

Secretary—Mr. A. H. Blechynden.

Council—Mr. C. E. Creswell, Mr T. H. Moseley, Mr. A. S. Sawers, Dr Fabre Tonnerre, Mr S. Jennings, Major W. N. Lees, Baboo Peary Chand Mittra, Mr. S. P. Griffiths, Baboo Gobind Chunder Sen, the Hon'ble J. P. Norman, Mr. C. Weskins, and Baboo Horro Chunder Ghose Bahadoor.

The Chairman stated, after reading the Report of the Scrutineers, that with reference to his own re-election as President, he was bound to acknowledge the honour which the Meeting had done him in thus confirming the nomination of the Council. He had done his best, however, to persuade his colleagues in that body to propose a new President; not from any wish on his part to shirk the duties which the office imposed on him, but from the persuasion that a change of all Office Bearers was conducive to the welfare and success of the Society.

Messrs Robinson and Crawford also returned thanks for their nomination as Vice-Presidents.

Standing Committees.

The revision of the Standing Committees was next entered on, and the names of the following Members were added where vacancies had occurred, viz.:—

Cotton.—Messrs. A. Stirling and M. Henderson. *Fibres.*—Mr. C. Weskins.

Annual Report.

The Secretary read the Annual Report.

The Chairman, in moving the adoption of the Report, again called attention to the disproportionate number of Native Members. These numbered but 65 out of 891 Members. This was the third successive Annual Meeting at which he had occasion to remark on the same disappointing fact He had observed in Native paper within the last month or so a reproof administered to the Zemindars for the want of interest which they took in the improvement of their estates The writer while discussing the subject of the late Famine in Orissa, asked the landholders why they did not exert themselves to increase the produce per beegah of their fields as farmers and agriculturist did in Europe He, (the Chairman,) pointed to the splendid sheaf of Carolina Paddy on the table as a proof of what might be done by careful and intelligent cultivation of the staple grain of Bengal

Baboo Peary Chand Mittra in seconding the motion for the adoption of the Report stated in reply to the remarks of the President, that he regretted the absence of the Native Members at the Meeting, [illegible] being the only Member present He would refer the President to the arrange[illegible]e at the last Annual Meeting as to the translation of the Report, which it ap[illegible]had not been carried out He feared that the objects of the Society were not sufficiently understood nor were the results of its labors known or appreciated He would therefore mov —

"That Rajah Suttyo Churn Ghosal Bahadoor, Baboo Joy Kissen Mookerjee and Cowr Harendra Krishna Roy Bahadoor be appointed a Committee for drawing up in Bengali a short paper as to the objects and labours of the Society, and the obligation on the part of the Zemindars and others to connect themselves with it, and that this paper be printed and circulated "

The motion was seconded by Mr Jennings and carried

The ordinary business was then proceeded with, and the following Gentlemen, proposed at last Meeting, were duly elected Members —

Messrs J Pitt Kennedy Thornton Warner Archibald Hyslop, V H Haldane, Dr Joseph Dinwiddie and Baboo Cally Coomar Roy

The names of the following Gentlemen were submitted as candidates for election —

George E L Dowson, Esq , Advocate and Notary, Moulmein,—proposed by Mr Joseph Agabeg, seconded by Mr Samuel Jennings

J Thorpe, Esq , Lucknow,—proposed by Mr A Foy, seconded by the Secretary

John Jonas Esq , Merchant, Calcutta,—proposed by Mr C F Pittar, seconded by Mr H J Joakim

W T Fraser, Esq , Agent, Bank of Bengal, Patna,—proposed by Mr A G Howard seconded by the Secretary

F D Daly, Esq , Manager, Simla Bank, Umballa,—proposed by Dr David Scott, seconded by the Secretary

Reginald Bambridge, Esq , Tea Planter, Gowhatty,—proposed by Mr F Jennings, seconded by Mr Joseph Agabeg

The following contributions were announced —

1 —The Madras Journal of Literature and Science, third Series, Part 2, October 1866,—from the Madras Literary Society

2.—Report on the Police of the Town of Calcutta and its Suburbs for 1865-66,—from the Government of Bengal.

3.—A quantity of Deodar seed,—from Dr. H. Cleghorn.

4.—A supply of Orchids from Port Blair,—from J. Homfray, Esq.

5.—A plant of *Gethyllis spiralis* from the Cape of Good Hope,—from A. Grote, Esq.

6.—A specimen of the Potatoes grown at Pangi, in the Punjab Himalayas,—from Dr. Geo. Henderson. Dr. Henderson mentions that these potatoes have been grown just beyond the reach of the rains. The potatoes now sent "weighed over two pounds when taken from the ground, and the quality of the crop is equal to the best English potatoes. The yield per acre was at the rate of over 550 maunds; one-twentieth of an acre being measured and the crop carefully weighed."

7.—Sample of Paddy raised at Comillah from Madras acclimatized Carolina seed,—from T. T. Allen, Esq.

6.—A sheaf of Paddy raised in the Soonderbuns from imported Carolina seed,—from C. E. Blechynden, Esq.

7.—A sample of Cotton raised at Mynpooree from New Orleans seed,—from C. Horne, Esq.

8.—A sample of Cotton raised in the Soonderbuns from hybridized seed,—from C. E. Blechynden, Esq. (Further particulars regarding this Paddy and Cotton will be found in the body of the Proceedings.)

A report was submitted by the Gardener on the collection of Rose plants recently received from Messrs. Garraway & Co., of Bristol Out of the 200 sent only 126 were found alive on opening the boxes; 13 have since died, and a few other look sickly.

Mr. Errington also reports that he has a good stock (about 2,580) of mango grafts for distribution.

Mr. S. H. Robinson moved—"That Dr. Anderson be requested to favor the Society with a copy of his scheme for planting out the Botanical Garden, which has been approved by Government, with the view to its publication in the Society's Journal." Seconded by Dr. Tonnerre, and agreed to.

Dr. Cleghorn exhibited a horizontal section of the wood of *Cedrus Deodara*, Himalayan Cedar, which had been prepared for the Paris Exhibition. The tree grew in Annandale, Simla, at an elevation of 6,000 feet above the Sea, and was about 120 feet high, the section being taken between 3 and 4 feet from base. The measurements were as follows.—Age (No. of Rings,) 212. Mean radius 1-11$\frac{1}{8}$. Measured girth 12 feet.

EXPERIMENTAL CULTIVATION OF CAROLINA PADDY AT COMILLAH, AND IN THE SOONDERBUNS.

The Secretary read a letter from Mr. T. T. Allen, Magistrate at Tipperah, on his trial cultivation of Carolina Paddy from seed supplied by the Society.

The Secretary also read a Memo from Mr C E Blechynden, in reference to the sheaf of paddy on the table

The Secretary also drew attention, in connection with this subject, to the following extract from a recent copy of the *Bangalore Herald* —

"A sheaf of paddy raised from South Carolina seed has been placed in the Mysore Museum, where it can now be seen. It was cultivated near the village of Huaky, about four miles from Bangalore, in the ordinary manner Three quarters of a seer of seed was sown on the 1st August, and reaped on the 7th December, and yielded 56 measures, being about 72 to 1, The yield of the best paddy of this country grown on the richest soil being only 40 to 1 The grain is remarkably large and white, and the straw very fine, and much longer than the common paddy A sheaf of common paddy planted on the same ground and reaped at the same time as the Carolina paddy has been placed in juxtaposition to it to show the contrast

COTTON

Read a report from Mr T H Mosley dated Manchester, 6th December, on certain samples of Cotton raised in Calcutta from the hybridized seed received last year from Major Trevor Clarke, of Daventry Mr Mosley adds—"As requested, I have furnished that gentleman with a copy of said report, from which you will observe that, although the samples include some very fine kinds of cotton, the majority show great deterioration from original stock in point of strength of fibre"

The Secretary also read the following Memo from Mr C E Blechynden, in reference to the sample of hybridized cotton on the table, which, it would be seen, partakes more of the character of the Egyptian than the New Orleans kind —

"Seeds of various descriptions were received by me from those raised in the A. and H Society's Garden from Major Trevor Clarke's hybridized stock These were planted on the 27th June last at Meenah Khan, in the Soonderbunds, one of the estates of the Port Canning Company All germinated freely The plants set well with bolls, and I collected four sorts, but during my absence in Calcutta, three of the baskets were stolen The specimen now submitted is from Egyptian crossed by New Orleans"

Read the following letter from Mr C Horne, Civil and Sessions Judge of Mynpooree, forwarding the sample of cotton alluded to under the head of Contributions —

"I beg to send a sample 1lb of cotton, acclimatized New Orleans, grown from seed supplied to me by the Collector here, in accordance with the instructions as circulated by the Collector of Allahabad

The cotton was sown after the early rain in trenches 1½ feet wide, 9 inches deep 5 feet apart.

It had nearly all to be sown twice on the trench system, but the rain rotted much of the seed, some indeed had to be sown thrice Thus it took at least 3 seers [illegible] 3 beegahs of land

The plants are now, after earthing up to the level, about 2 feet to 3 feet high, and laden with pods. Some 12 seers of cotton in seed have been gathered from it and it is coming in daily. Until the close of February I cannot report upon how it pays.

4½ feet from plant to plant is the distance, but it appears to me to be too great, 3 seeds sown and strongest plant only left. The sample sent being small was handpicked and cleaned, but I am cleaning a larger sample for the Agra Exhibition by Country Gin.

I should like an opinion as to quality and value, in order that I may tell zemindars what profit they may expect to make in its growth.

The expense of watering, (4 times as yet) and digging, earthing up and manuring, is very great, and I am keeping a careful account of the same."

The Secretary stated that Mr. E. G. Buskin, a Member of the Cotton Committee, had obligingly reported on this cotton to the effect, that it is about equal to Fair Dhollera, long in staple, strong and silky, and worth about one shilling per pound.

For the above communications and presentations the best thanks of the Society were accorded.

Wednesday, the 20th February, 1867.

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz.* —

Messrs. G. E. L. Dawson, J. Thorpe, John Jonas, W. F. Fraser, F. D. Daly, and Reginald Bainbridge.

The names of the following Gentlemen were submitted as candidates for election. —

Major F. B. Forster, 5th Fusiliers, Ferozepore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

F. W. R. Cowley, Esq., C. S., Hajeepore,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Hugh D. Fergusson, Esq., Indigo Planter, Allyghur,—proposed by Mr. Alexander Lawrie, seconded by Mr. W. Minto.

Robert Tucker, Esq., Tea Planter, Seebsaugor,—proposed by Mr. Alexander Lawrie, seconded by Mr. J. P. Mackilligan.

G. W. Strettell, Esq., Forest Department, Sind,—proposed by the Secretary, seconded by Dr. Hugh Cleghorn.

Thomas Peachy, Esq., Financial Department, Calcutta,—proposed by Mr. Joseph Agabeg, seconded by Mr. S. Jennings.

Lieut.-Colonel B. Walton, Military Store-keeper, Calcutta,—proposed by Mr. S. Jennings, seconded by the Secretary.

The following contributions were announced:—

1.—Report of the Committee of the Bengal Chamber of Commerce, from May to October 1866—from the Chamber.

2.—Selections from the Records of the Government of India, Foreign Department, No. 57,—from Government of Bengal.

3.—Descriptive Catalogue of Vernacular Books and Pamphlets, forwarded by the Government of India to the Paris Universal Exhibition of 1867, compiled by the Reverend J. Long,—from the Compiler.

4.—A collection of Orchids, Ferns, &c., from Cherra-Poonjee,—from C. K. Hudson, Esq.

5.—A collection of Orchids, &c., from Port Blair,—from Major Ford.

These have all arrived in excellent condition.

6.—Samples of Fibre, Tow, and Line from *Fourcroya gigantea*,—from Alexander Thompson, Esq

"I am afraid,"—observes Mr. Thompson,—"that from the small return of fibre in proportion to the quantity of leaf operated upon, that I shall have to give up further experiments, but if the tow could be utilized, it might be prepared to advantage. Any information you could give me regarding its cultivation, and especially the length of time it takes in coming to maturity, will be most acceptable.

"I have labelled each kind with a No. to which the description belongs.

No. 1.	"*Fourcroya gigantea*,"	The leaves were crushed and steeped for nine days, then again crushed, dried, and hackled.
2.	"	Treated the same way as No. 1, but passed through Sandford and Malloroy's Machine before being hackled.

3. The Tow produced in hackling No. 1.

4. The same do. do. " 2.

The Line was prepared from sample " 1.

The leaves operated upon I received from Mr. Scott of the Botanical Gardens, and the average return according to weight is, as near as I can at present estimate, at 5 per cent, of which two per cent becomes tow in hackling, leaving only 3 per cent of good clean fibre."

The Secretary submitted a list of seeds recently gathered by the Gardener and which are available to Members, including *Aralia papyrifera*, (Chinese rice paper plant) *Poinciana regia*, double Balsam, Guinea grass, &c., also Deodar seed received from Dr. Cleghorn.

HORTI-FLORICULTURAL EXHIBITION.

Read the following Reports of the Judges on the Show of Vegetables, Fruits and Flowers, held in the Sailors' play ground on the 26th January.—

Horticultural.—Considering the lateness of the rains, and the heavy falls experienced at the close of October last, which must have destroyed a good portion of the vegetables sown early in the season, thereby necessitating fresh sowings; the vegetable department which, with a few exceptions, was furnished as usual from the market gardeners, reflected much credit on them for the general success of their cultivation.

Among the more prominent kinds, it may be observed that the *Brassica* tribe was well represented, with the exception of Cauliflowers which were indifferent as compared with previous exhibitions —the Cabbages were very fine, both large and small kinds; Nolo Kole very good, both in quantity and quality; this remark is applicable to the Turnips, which were superior to those of last year. Of Carrots of several varieties there was an abundance, all well grown. The Beet was, perhaps, better than at any previous show, and there were many baskets of them. Of Onions and Leeks there was a fair display, with a few extra fine specimens. The Artichokes were also very good. The Potatoes though good, were not perhaps quite up to the mark, and the Peas were decidedly indifferent Of Beans some first rate specimens were produced, especially of the long pod and French kinds. The competition in respect to Celery was spirited, and several excellent specimens were submitted, though early in the season for this fine vegetable; the first prize and a medal was awarded to Mr. J. F. Watkin's Mallee, Mr. E. C. Daniell's Mallee carried off the second prize, the 3rd and 4th prizes were awarded to native competitors. Of Lettuces there was a good collection; Mr. T. Savi's Mallee won the first prizes for both cabbage and cos varieties, the 3rd was given to a native gardener. Of Endive and Spinach there were a few good baskets. In the miscellaneous stock, several well grown specimens were placed on the stands of Scorzonera, Parsley, Horse-radish, Tomatoes, herbs of kinds, water cress and Indian corn. Radishes were in small quantity and that indifferent. A very good collection of Squashes was brought forward, the first prize for which was given to Mr. S. Leslie's gardener.

Among the native vegetables were good collections of Beans, Tomatoes, Brinjals, Cucumbers, Yams, and Saugs of sorts.

In the assortment of fruits, several fine baskets were shown of Sapotas, Rose-apples, Pomegranates, Pineapples, Pummelows, Limes, Papeeas, Plums (Byer) both round and long varieties, Tipparees, and Bael, the Plantains were indifferent.

Altogether, this may be considered a very fair exhibition as compared with those of previous years. About 100 gardeners were in attendance, and prizes amounting to Rs. 323 were awarded to 57 gardeners.

C. E CRESSWELL
JOSEPH AGABEG.
PEARYCHAND MITTRA.
C. FABRE TONNERRE.

Floricultural —This show may be regarded as altogether better than that of last year though, perhaps not quite so good as in some previous years

The collection of Roses was very good, including several new varieties ten gardens competed To Captain Paterson's Mallee was awarded the first prize of 8 rupees for the best collection in pots, including 5 new varieties Mr G Livesay's Mallee carried off the prize for the second best collection in which was included 8 new varieties Mr Torveen's gardener took the prize for the 3rd best collection To Mr J C Campbell's man was awarded a prize for a good specimen of "Souvenir de la Malmaison" and to Mr Livesay's Mallee for the best specimen of a new Rose 'Madame Vidot'

Of Camellias the collection was very small Baboo Bindabun Chunder Mitter's Mallee took the 1st prize Mr W Stalkartt's the second and to Mr Grote's man was awarded a prize for the best specimen, a fine grown plant with rose colored flowers

Of Orchids there was a poorer display than is to be expected at this season To a small collection of 16 well grown plants, (including two specimens of *Phalaenopsis*, but not in flower) from Mr J C Campbell's garden the first prize was awarded, the second to Baboo B C Mitter in which were a *Cypripedium* and *Brassavola cucullata*, and the third to Mr A M[illegible]'s garden Mr S Jennings submitted a well grown plant, in full flower of *[illegible]*, to which a prize was given, and from the same gentleman's garden came a small plant of an *Anaectochilus*

Ten gardens competed for the prizes for Pelargoniums about the finest collection that has been exhibited of well grown healthy plants though not in flower To Messrs Campbell and H Wood's Mallees the first and second prizes were awarded, in each collection were 13 kinds Mr J A Crawford's Mallee gained a prize for the best specimen and Mr E Lushington's Mallee for a new kind The competitors deserve praise for keeping these fine plants in such good condition through the rainy season Most of them were probably several years old

Begonias and *Oxalis* were well represented Captain Paterson's Mallee gained a prize for an extra good collection of the former, (including hybrid from *B rex*) in which were several very nice specimens, to the Dalhousie Square garden the second prize under this head was awarded

Several good plants of *Euphorbia Jacquiniflora* were placed on the stand *Verbenas* likewise showed tolerably well

The bulbous tribe was altogether poorly represented, but several good plants of *Caladium* were submitted, and some nice specimens of *Amaryllis* from Major Raban's garden, and *Lilium Wallichii* from Mr E Lushington's garden, were also introduced

Of the Composite family there was not much worthy of note, except a pretty new variety of yellow *Zinnia* raised in the Dalhousie Square Garden from seed from Messrs Vilmorin, Andrieux & Co of Paris.

Among the *Scrophulariaceæ* several good specimens of *Antirrhinums* were shown from Mr. A. Stirling's garden, *Veronica Syriaca* from Captain Burbank's garden, and a well grown plant of *Lophospermum erubescens* from Mr. G. Livesay.

An exceedingly fine collection of the Cactus tribe came from Mr. Zorab's garden, the best that has ever been exhibited, and to which was awarded a prize of 8 rupees. This collection contained specimens of *Cactus*, *Cereus*, *Opuntia*, *Stapelia*, *Caralluma* and *Euphorbia*.

The Ferns were exceedingly well represented, better even than at the last Show: prizes were awarded for the three best collections to the gardeners of Sir C. Beadon, Messrs. Zorab and Stirling. There were also large collections of plants with variegated foliage, including *Pothos variegata*, *Cissus discolor*, *Sanseviera Zeylanica*, *Dracæna terminalis*, *Codiæum variegatum*, &c. The Mallees of Rajah Sutto Shurn Ghosaul, Sir C. Beadon, and Captain Paterson carried off prizes for the 1st, 2nd, and 3rd best collections.

Mr. S. Jennings exhibited two healthy grown China and Assam Tea plants.

About 30 gardeners competed, and prizes were given to 24 to the extent of Rs. 207.

H. Cleghorn, M.D.
Geo. [illegible]
John Scott

Resolved—That the best acknowledgments of the Society be given to Captain Tierney of the Ordnance Department for his kind assistance in the way of tents, and to Colonel Glyn for the services of the band of the Rifle Brigade on the day of the above Show.

POISONOUS PROPERTIES OF ANDROMEDA

The Secretary read a paper from Dr. Hugh Cleghorn on the above subject.

CHINA AND JAPAN SILK

Read a letter from Messrs. Apcar & Co., regarding a supply of Silkworms' eggs from Japan.

The Secretary announced that these eggs had reached too late in the season, for on opening the box he found that all had hatched. The eggs from China, also procured through the kind aid of the same Firm, having arrived in November last, were in excellent condition, and had all been distributed.

In connection with the above, the Secretary read the following report dated 26th June 1866, from Messrs. Durant & Co. of London, to Messrs. Jardine, Skinner & Co., on silk raised in the Radnagore District, from the Japan eggs distributed last year by the Society:—

"The sample of raw Silk reeled by Messrs R. Watson & Co., from cocoons, the produce of Japan seed raised in Bengal, is an excellent specimen in all respects; not only is the color and the quality good but the thread is particularly even, clean, and free from small foul. We find it has not quite the stamina of French and Italian Silk but it is certainly superior to the latter in cleanliness, evenness and color, and quite equal to the former in these respects. The present value of good Italian, the produce of Japan seed, is about 30s nett, and we should place the samples in question about the same."

HYBRIDIZED COTTON

The President submitted the following extract of a letter to his address from Major Trevor Clarke of Welton Park, Daventry, regarding the samples of Cotton raised last year in the Society's Garden and elsewhere, from hybridized seed forwarded by him (Major Clarke) in 1865:—

"I have just received from Mr Mosley, Manchester, the report of my Cotton from the Liverpool broker; the whole subject will require much explanation from me, which I will do in the form of an article for the Agri-Horticultural Society's Journal. This I will forward without fail in a few days. It should accompany the publishment of the report. Many of the hybrids were mere scientific experiments, some were produced of bad sorts, some no hybrids at all and so on. Don't circulate seed of them till you hear from me. You will see why, when you read my forthcoming paper.

"I have been working hard at the subject and I am at last getting the Arboreous sorts to seed and cross. I send you one or two and I will send more."

Read also the following report by Mr Mosley (a Member of the Committee) on the Cotton submitted by Mr C. J. Blechynden at the last Meeting:—

"Herewith I return the sample of Cotton raised in the Soonderbuns from acclimatized seed of Major Trevor Clarke's cross between Egyptian and New Orleans.

"This Cotton is a most useful description of fair staple and strength of fibre, retaining characteristics of the New Orleans rather than Egyptian stock. I estimate its value in the home market at about 18d per lb."

COMMUNICATIONS ON VARIOUS SUBJECTS

The following letters were also read:—

1.—From Major W. N. Lees forwarding copy of a letter from Kangra, about Cattle disease which had broken out in the valley:—

"A disease similar in many respects I believe to the Cattle plague in England, is now very prevalent in the Kangra Valley which first began to show about M[illegible]i and Byjnauth, and gradually worked its way in this direction. On the Soogal plantation, out of their stock of 27 cattle, 24 of them suddenly died the other day. I could give several instances of a similar kind which have occurred amongst the Cattle belonging to the Zemindars in the villages surrounding the Nassau Company's estate at Bamouree and also about Bundla. As a rule the cattle die 5 days after they have been attacked with the disease; one or two instances occurred amongst the Zemindars' cattle grazing on the Company's estates, which seemed to have had all the symptoms of the disease. Since then I had all the outsiders' cattle turned off the Company's grazing ground till the danger had ceased. I am glad to say that as yet none of the Company's cattle have been affected, however, there is no knowing how soon it may reach them. I am using every mean in my power to prevent it, and in the event of a case occurring, I shall take immediate steps for the bullock removed and have it cured if possible. The only cure I know of, is 20 grains alum, 20 grains red pepper, and 2 grains opium, mixed with a little flour and forced down morning and evening and drinking water slightly warmed, to be used for 5 days. If you can propose any other remedy I shall feel obliged if you will give me the receipt.

"The Kangra officials don't seem to be aware of the disease, as they have taken no steps (as far as I am aware) to prevent its spreading."

2.—From H. Cope, Esq., Umritsur, regarding Dr. Cleghorn's *Clavis Analytica* for Himalayan *Coniferæ*, and the late Colonel Madden's articles on the same subject:—

"I see it announced in the Report of the Proceedings of the Meeting of the Agri-Horticultural Society of the 19th December 1866 that Dr. Cleghorn exhibited to the Meeting drawings of Cones of six different species of *Pinus*, *Cedrus*, *Abies* and *Picea* found in the N. W. Himalayas and mentioned that he had prepared a *Clavis analytica* of the essential characters of these Conifers. It may not be generally known that Major Madden, when an Officer of the Bengal Artillery, prepared and published many years ago a most elaborate and accurate Monograph of the Conifers of the Himalayas accompanied by the most instructive notes on the habits, appearance, value, vernacular nomenclature, &c., of the several species. Unfortunately the paper was published in a somewhat obscure, and as it proved, very ephemeral journal of Medicine and Science projected and edited by Dr. W. R. McGregor, of the 1st Bengal Fusiliers, and I doubt much if a single complete copy be now procurable. Should you be in a position to secure a copy, I would strongly suggest your having the paper reprinted in conjunction with Dr. Cleghorn's. The proof sheets passed, at his request, through my hands, so that I can speak of the great value of Major Madden's paper."

The Secretary mentioned he had informed Mr. Cope that the paper in question had been reprinted in Volume IV of the Society's Journal and a supplementary original paper in Volume VII.

3.—From Dr. George Henderson, Honorary Secretary, Punjab Agricultural and Horticultural Society, intimating the receipt, in excellent condition, of a collection of plants from Mr. Waterer of Bagshot:—

"I yesterday opened two cases of plants sent out from England by Mr. Waterer of Bagshot, and packed according to the plan invented by Mr. Thomas Christy

These plants left England in November 20th and reached Lahore January 20th each box weighed a little over a maund and contained 50 plants, with four exceptions, every plant was as fresh as the day it was packed If any of the subscribers to the Calcutta Society ask your advice about getting plants from England you should advise them to order the plants from Mr John Waterer of Bagshot, Surrey

'The great point is to have the plants landed in India early in the season, say not later than the end of January and earlier if they have to go up-Country'

4.—From Secretary, Government of Bengal, forwarding a report by Dr Thomas Anderson, regarding the culture of the Mahogany tree in the Botanical Garden, Calcutta (To be published in Journal)

5.—From R W King Esq Mulli suggesting the establishment of a Branch Garden at Darjeeling for the acclimatisation of plants for introduction into the Plains

Agreed to call Mr King's attention to Dr Anderson's letter in the December Proceedings regarding the Garden attached to the dwelling houses of the European Gardeners engaged in cultivating Cinchona in Darjeeling Dr Anderson reports that the good quality of the seeds raised in this garden is so encouraging that he hopes Government may be induced to sanction a small expenditure on this garden in order that seeds may be obtained in large quantities for distribution in September for growing in the Plains

From Dr Forbes Watson London, 9th January in reply to a requisition for Carolina Paddy and Mahogany seed An order has been given for one ton of sound Carolina Paddy with directions that if possible, it should be shipped direct from the most convenient American port in parcels of one cwt each Enquiries have also been made with respect to the West India Mahogany tree seed, but, as yet, without any satisfactory result

7.—From J C Wilson Esq, C B applying for a quantity of Himalayan Tea seed to be placed in Wardian cases for trial at his estate in Canterbury, New Zealand.—Complied with

Letters were submitted from Mr Weskin, and Baboo Hurrochunder Ghose in acknowledgment of their election to the Council, and from Messrs M Henderson and A Stirling intimating their acceptance of office on the Cotton Committee.

Wednesday, the 20th March, 1867

A Grote Esq, *President, in the Chair*

The Proceedings of the last Meeting were read and confirmed

The Gentlemen proposed at the last Meeting were elected Members viz —

Major F B Forster, Messrs F W R Cowley, Hugh D Fergusson, Robert Tucker, G W Strettell, Thomas Peachy, and Lieut.-Col. B Walton.

The names of the following Gentlemen were submitted as candidates for election

Captain F J S Whiteside, District Inspector of Musketry, Saugor,—proposed by Colonel W H Seymour, C B, seconded by Major F Lukin

W J Macdonald, Esq, Tea Planter, Assam,—proposed by Mr W Stalkartt, seconded by Mr S Jennings

C H Ogbourne, Esq, Albert Insurance Office, Calcutta,—proposed by Mr Jennings, seconded by Mr Joseph Agabeg

Baboo Woomes Chunder Roy, Zemindar, Norail, Jessore,—proposed by Baboo Kally Prosonno Roy, seconded by the Secretary

J H Adams, Esq, Tea Planter, Seebsaugor, Assam,—proposed by Mr Jennings seconded by Mr R Blechynden

Captain R C Money, Deputy Commissioner, Maunbhoom,—proposed by Mr. E V Westmacott seconded by the Secretary

J Bridgnell, Esq, Accountant, Mint—proposed by the Secretary, seconded by Mr Agabeg

The following contributions were announced —

1 —Journal of the Royal Asiatic Society of Great Britain, Vol 2, Part II,—from the Society

2 —Journal of the Asiatic Society of Bengal Part 2 No III, 1866,—from the Society

3 —Experimental investigations connected with the supply of water from the Hooghly to Calcutta, by David Waldie Esq —from the Author

4 —Patent Office Reports (United States of America) for 1862, Vols 1 and 2,—Smithsonian Institution Report for 1864 and Proceedings of the Boston Society of Natural History for 1864 65,—from the Smithsonian Society

5 —Annual Reports for 1865 66 of the Madras and Bombay Presidencies of the Punjab Territories, of Mysore Coorg the N W Provinces, Central Provinces, Straits' Settlements and Andaman Islands —from the Government of Bengal

6 —A collection of Orchids from Cherrapoonjee,—from C K Hudson, Esq.

7 —A collection of Orchids from Assam —from S Jennings Esq

8 —A plant of *Dietes tricolor* or *Iris moræoides* from the Cape,—from A Grote, Esq

9 —A plant of *Ornithogalum umbellatum*,—from Baboo Anund Chunder Mitter.

10 —A small assortment of seeds from Honolulu,—from Dr W Hillebrand

11 —A supply of Egyptian Cotton Seed —from Messrs Mosley and Hurst, Honorary Secretaries, Manchester Cotton Supply Association

This seed is now in course of distribution, it has germinated most freely—90 per cent—in the Society's Garden

12 —Several samples of cleaned Cotton and Cotton in seed from Cawnpore—from F Halsey, Esq

(Further particulars regarding this Cotton will be found in the body of the Proceedings)

The following plants were exhibited —

By Mr S Jennings—Two finely flowered Dendrobes, *viz*, *D fimbriatum*, var *oculatum* (the dark-eyed fringed Dendrobe), and *D pierardii*, also a small plant in flower, of *D amœnum*

By Mr Arthur Moubray -Two well-flowered plants of *Dendrobium cœrulescens*, and *Saccolabium retusum*

By Mr John Lynam—A plant, in fine flower, of *Dendrobium*——? and another of *Saccolabium miniatum*

By Baboo Anund Chunder Mitter—Two healthy plants of *Phalænopsis amabilis*, a fine specimen of *Strelitzia Reginæ*, and a plant in good flower, of *Ornithogalum umbellatum*

A fine flowering specimen of *Phaius Wallichii* from the Society's garden was placed on the table, as also several flowers of Hollyhock, and plants of Sweet Pea The Gardener reports that these Hollyhocks are the produce of two years' acclimatized seed He has not found plants raised from English seed to bloom the first season The dark colors appear moreover to run out as most of those raised this season have light blossoms, although a good quantity of seed from darker colors was saved from last season

Mr S P Griffiths remarked in reference to the Gardener s experience, that he had hollyhocks now in full bloom raised from seed brought out by him last year from England

In regard to the Sweet Peas, Mr Errington observes that the acclimatized and imported English seed were sown in the same soil on the 2nd November, the acclimatized produced first bloom on the 27th January and has since flowered freely—of many colours, the imported not till the 9th March, and then only a few flowers, and of one color The former attained the height of nearly 7 feet the latter about 3 feet Mr Errington adds, that a trial of French seed last year gave much the same result as the English seed He was told by Mr R Scott, late Head Gardener of the Botanic Garden, that he never knew plants raised from imported seed to yield flowers, though he had tried them for 15 years in succession, but these were always grown in pots

Dr Cleghorn exhibited the larvæ of Insects which prove destructive to timber These had been sent by Mr Edwards, Collector of Bareilly, to the Government N W P, and transmitted to the Forest Office The branch of a Sirras, tunnelled through by one of the varieties, accompanied the larvæ

Mr Grote remarked that the larger larvæ looked like those of a species of *Prionus* of the Longicorn order The term "ghoon given by Mr Edwards, he had heard applied to similar ravages in Bengal, which were attributed to a *Bostrichus*, another very minute beetle

Copy of Mr Edward s report to the Commissioner of the Rohilcund Division, which was published in the supplement to the Allahabad Government Gazette of the 20th March, accompanied these specimens, for which the thanks of the Meeting were offered to Dr Cleghorn

MONTHLY EXHIBITIONS OF RARE PLANTS.

Read the following report from a Special Committee of the Council regarding the proposed Exhibition of Ornamental Plants at the Monthly General Meetings —

Your Committee having taken into consideration the resolution, noted in the margin, as passed at the last Monthly Meeting of the Council, now beg to report as follows:—

"That Mr. Jennings, Mr Robinson and Roy Hurro Chunder Ghose be requested to consider and report on the subject of Floricultural and Agricultural Exhibitions at the Monthly Meetings of the Society, and also as regards the admission or non-admission of the competitors, and the rules of adjudication."

First.—That Members of the Society be invited to exhibit at the Ordinary Monthly Meetings of the Society any rare or well-grown plants, whether indigenous or foreign

Second.—That Jurors, to be appointed as hereinafter provided, shall award any number of marks not exceeding 10 for each plant, &c., exhibited, on taking into consideration its rarity, difficulty of cultivation, or the success with which it has been grown, or has blossomed

Third.—None but Members of the Society shall be eligible to compete for such marks, and the plants shown must be the produce of their own garden.

Fourth.—When a Member has obtained an aggregate award of fifty marks, he shall be entitled to receive one of the Society's Bronze Medals.

Fifth. Should any successful exhibitor elect to wait for the Silver Medal, he will be entitled to receive one when he has obtained the aggregate award of two hundred marks.

Sixth.—Exhibitors, if called upon by the Jurors, will be expected to furnish full particulars of their mode of treatment, and the circumstances under which the plants, &c., exhibited, have been grown.

Seventh.—Plants to be exhibited at the Monthly Meetings must be sent to the Secretary not later than noon of the day of Meeting.

Eighth.—It shall be competent for the Judges at the general Public Shows to award marks for plants exhibited under these rules.

Your Committee have purposely omitted Agricultural produce in this scheme, as samples are already submitted, and they doubt if any system of marks would attract more.

Your Committee recommend that the substance of this Report, if approved, be introduced into the Proceedings of the next Monthly Meeting, and that copies be struck off and distributed to all who are likely to co-operate in making the Meetings as interesting as possible.

(Sd.) SAML. JENNINGS.
(„) S. H. ROBINSON.
(„) HURRO CHUNDER GHOSE.

CALCUTTA,
March 9th, 1867.

Baboo Peary Chand Mittra proposed that the Report be adopted with this modification of the 3rd clause viz., "All lovers of plants are eligible to compete for marks at the Monthly Shows."

The Chairman said that he had already expressed himself in the Council in favor of the Baboo's amended rule, as he thought that plant-growers would like to see the best plants wherever grown, sent to these Shows. A large majority, however, of their Members were in favor of limiting the competition, and he therefore, thought the Meeting had better adopt the Committee's rules as they stood. They could be modified hereafter if necessary.

After some further discussion the Report was put to the vote and carried.

It was agreed that the following Gentlemen be requested to form the Committee of Jurors, viz., Messrs A Grote, S P Griffiths, W Stalkartt, J A Crawford, S H Robinson, C Weskins, S Jennings, G S Logan, A Mowbray, G Ruxton, R M Thomas, Dr Francis, Colonel Herbert, Dr W[illegible], Capt Paterson, Rajah Suttshurn Ghosal, Baboos Hurrochunder Ghose and Bindabun Chunder Mitter.

REPORT ON TRIAL OF CARVER'S SAW GIN

Read the following letter from Mr I. Halsey of Cawnpore, forwarding certain specimens of Cotton illustrative of a trial made with the Saw Gin (Carver's) lent to him by the Society, and with the native *Churka* or Roller Gin:—

"I have the pleasure to hand you a railway receipt for a small parcel containing samples of kapas and cotton thus marked—

B—is ordinary kapas as grown in these parts.

C—is cotton cleaned from the same kapas by the ordinary native *Churka*.

A—is cotton cleaned from the same kapas by Carver's Saw Gin.

D—is kapas grown on the model farm Cawnpore, from seed supplied by Government, supposed to be New Orleans seed, acclimatized in Dharwar.

E—is cotton from the above kapas cleaned by the ordinary native *Churka*.

F—is cotton from the same kapas cleaned by Carver's Saw Gin.

I may inform you that I have tried Carver's Gin driven by steam power on several occasions and have come to the following conclusions: that a six-horse power engine could drive five Gins similar to the one I am now reporting on, at a cost of Rs 14 per diem, including superintendence, firing, oil, and hands to feed the Gins. Each Gin would turn out 6⅔ maunds of clean cotton per diem of 10 hours, for which they would earn Rs 6-10-8, at Re 1 per maund, or Rs 33-5-4 for the five Gins. The cotton turned out would sell at Rs 2 per maund above the ordinary market value, which we may fairly put to credit of the Gin, or Rs 66-10-8 for the five Gins, equivalent to a gross profit of Rs 100 per diem, from which, deducting Rs 14 per diem as above, there would remain a net profit during the

cotton season—of 180 days—of Rs. 11,000, or 220 per cent. per annum on the outlay, allowing Rs. 3,000 as cost of Steam Engine
,, ,, 2,000 cost of five Gins
5,000

both Engine and Gins being in hand and paid for.

I may mention that these conclusions have been arrived at from experiments tried with the Gin in the state I received it from the Agricultural and Horticultural Society. Were the machine in perfect order, I feel certain that it could turn out what Messrs. Carver & Co. say it can do, *viz.*, 75 lbs. of clean cotton per hour. In one experiment I turned out more than 80 lbs. in the hour, but from the brushes being worn out and not cleaning the saws properly, the staple was cut in the operation. Since then I have had the brushes renewed, and now find that the Gin acts perfectly. I may also inform you that the Gin could be made here with great ease for Rs. 250, the only part of it which would have to be imported would be the saws.

I must add that I have to thank Mr. T. G. A. Palmer and the Elgin Cotton Mills for lending me steam power to drive the Gin, and have to inform you that I have handed it over to my brother Mr. W. S. Halsey, who will be answerable to the Society for it."

Resolved.—That the best thanks of the Society be given to Mr. Halsey for the above communication and to Mr. Palmer for the assistance rendered by him and that Mr. Halsey be requested to send down larger specimens with the view of having them reported on by the Fort Gloster Mills and Goosery Mills Companies.

Communications were announced—

From Mr. S. Kurz of the Calcutta Botanic Garden, presenting a paper on the Plantains of the Indian Archipelago. (Transferred for the Journal.)

From the Secretary, Agricultural and Horticultural Society, Madras, returning thanks for Singhara seeds and Rhea plants. In respect to the requisition for a further supply of acclimatized Carolina Paddy, Dr. Bidie observes:—

"I have got some Carolina Paddy for you, and the Board of Revenue have issued circulars to Collectors calling upon them to send me as much as can be spared. I hope, therefore, by the end of this month to be in a position to send you what you want. It has answered remarkably well in nearly every District in which it has been tried in this Presidency, and the few failures may all be attributed to ignorance on the part of the ryots as to the proper mode of cultivation. Most of the Collectors beg for further supplies of seeds. In one instance it was cultivated like a *dry crop*, and under the influence of a heavy Monsoon gave a very fair return of straw and grain, and both infinitely superior to the products of the country hill rice cultivated in that way."

From the Secretary, Royal Asiatic Society of Great Britain and Ireland, returning thanks for certain copies of the Journal of the Agricultural and Horticultural Society of India.

(Wednesday, the 17th of April 1867)

A Grote, Esq, *President, in the Chair*

The Proceedings of the last Meeting were read and confirmed

The Gentlemen proposed at the last Meeting were elected Members, viz —

Capt F J S Whiteside, Baboo Woomes Chunder Roy, Messrs C H Ogbourne, J H Adams W J Macdonald, J Bridgnell, and Capt R C Money

The names of the following Gentlemen were submitted as candidates for election —

Dr J P Brougham, Presidency Surgeon,—proposed by the Secretary, seconded by Mr Grote

Baboo Isan Chunder Sircar, c e —proposed by Mr Joseph Agabeg, seconded by Baboo Peary Chand Mittra

The Rev E Kemble Chaplain of Cuttack,—proposed by Lieut Col W G Owen, seconded by the Secretary

Fred R Browning, Esq c e, Jamtarrah, Assensole,—proposed by Mr W Stalkartt, seconded by Mr Walter Bourne c e

Lieut Col R C Tytler, Umballa —proposed by the Secretary, seconded by Mr S H Robinson

The Honble A G Macpherson, Judge of the High Court,—proposed by the Honble J P Norman seconded by Mr Grote

Lieut W J Williamson Assistant Commissioner, Garrow Hills,—proposed by Mr J Mackillican, seconded by the Secretary

Baboo Wopendrokomar Mittra —proposed by Roy Hurro Chunder Ghose Bahadoor, seconded by Baboo P C Mittra

George Smeaton Esq, c s, Jajpore, *via* Balasore,—proposed by Mr Joseph Armstrong, c s, seconded by the Secretary

C E S Innes, Esq, Bengal Police, Jajpore,—proposed by Mr Armstrong seconded by the Secretary

The following contributions were announced —

1 —Report of Proceedings Government of India in the P W Department for 1864 65 Report of the Administration of the Bombay Presidency for 1864 65 Annuals of the Administration of Oude British Burmah, and Hyderabad Assigned Districts for 1865 66,—from the Government of Bengal

2 —Report of the Agricultural and Horticultural Society of Western India for the year 1865,—from the Society

3 —Another collection of Orchids (principally *Dendrobia*) from Cherraponjee, from C K Hudson, Esq

4 —A large collection of Orchids from Port Blair,—from J M Homfray, Esq

5 —A large quantity of acclimatized "Imphee (*Sorghum*) seed,—from Mr Thomas Greenhill

Reports were submitted from the Gardener on the germination of certain collections of seeds, received during the last six months, namely acclimatized (Darjeeling) flower seeds from Dr Anderson, acclimatized (Simla) flower seeds, from Dr Cleghorn, acclimatized (Lahore) vegetable and flower seeds from the Garden of the Agricultural and Horticultural Society of the Punjab In respect to the vegetable seeds from Lahore, Mr Errington reports as follows —

"The Cauliflowers were very bad, this is the 2nd trial Lahore seed has had here, each time producing heads about the size of a small orange From what I have seen of it, I think it will never answer here

Carrots, Beet, Lettuce Peas Knol-kole Water Cress, Tomatos, and Peas were very good and quite equal to produce of English seed '

Of the flower seeds from Lahore he reports,—"All those that germinated proved as good if not better than English seed They did not germinate so freely as they should have done, being very likely injured by damp at the close of the rains those I have marked are very good and would be worth obtaining again for distribution "

EXHIBITION OF RARE PLANTS

The Secretary having previously drawn attention to the collection of plants which had been sent in by several Members in response to the Report of the Committee, as published in last month's Proceedings read the following detailed list —

From Mr Grote's Garden —Four plants of *Phalænopsis grandiflora* in fine flower, one of *Camarotis purpurea*, one of *Vanda teres*, and flowers of *Napoleana imperialis*

From Mr W Ter Veen's Garden —Eight plants consisting of seven kinds of *Caladia*

From Mr Arthur Mowbray's Garden —An Orchid, in flower, from Rangoon. *(Cœlogyne Schilleriana ?)*

From the Garden of the Rajah Suttchurn Ghosal Bahadoor —Ten pots consisting of seven varieties of *Caladia* two plants of *Renanthera coccinea*, one of *Eulophia virens*, one of *Oncidium luridum* and four plants of *Gesnera*

From Mr Samuel Jenning's Garden —Fourteen *Caladia*, including four new kinds, *C rubicaule*, *C argyrospilum*, *C mirabile*, and *C Schilleri*

From Mr T W Swiden's Garden —Five plants of *Gloxinia* and one of Asters

From the Royal Botanical Garden —(For exhibition, not for competition) Plants of *Saccolabium ampullaceum*, *S miniatum*, *S* species from the Andamans, *Cœlogyne Parishii*, *Oncidium ampliatum* *Eulophia* species, *Cyrtopera sanguinea*, Darjeeling, *Statice durruscula*, *Salvia glutinosa*, *Begonia rubro-venia*, *Caladium Belleymii*, *C Pœcile*, and *Cinchona succirubra*

Dr Anderson drew attention to the two plants of *Cinchona succirubra* in the above collection These plants had been growing in flower pots in the Botanical Gardens since October He remarked that the different appearance of these plants illustrated the different effects of shade The plant of *Cinchona succirubra* with large soft very slightly hairy dark-green leaves and pale green stems had been grown among ferns and other shade-loving plants in a house made after the model of the Native sheds, in which the Betle Peppers are cultivated, while the *Cinchona* with firm rather small reddish hairy leaves and red stems and bracts had been grown in the open air Both plants although differing very much in appearance were quite healthy

The fine plant of *Salvia glutinosa* Linn in full flower, raised from seed sent from Simla was shown as an interesting example of a species from a thoroughly temperate region of the Himalaya, flourishing in a climate so different from that of its native country Dr Anderson said that this species of *Salvia* had a very wide geographical range It is found in Southern and Central Europe, in the Taurus and Caucasus, and the mountains of Persia

Dr Anderson remarked that the very rare European plant *Statice dumuscula* Girard a native of the sea shores of the south of France and the Balearic Islands, produces in the morning abundance of pale pink flowers which drop off in the afternoon

Dr Anderson further called attention to two species of Orchids in the above collection which, he stated, often occurred incorrectly named in gardens about Calcutta The brick-red flowered one *Saccolabium miniatum* Lindl Bot Reg 1848, tab 58, was stated to differ little from the other species before the Meeting, and which was correctly called *Saccolabium ampullaceum* Lindl figured by Lindley in the 17th plate of the Sertum Orchidaceum *Saccolabium miniatum* (sometimes called *Saccolabium curvifolium*) extends from Assam to the Province of Martaban

Coloured drawings of some interesting plants were also shown One of these was a drawing of a very fine *Dendrobium* belonging to the Dendrocoryne section of that large genus, and allied to *D densiflorum* and *D Farmeri*

Dr Anderson said that the species was probably the *D Palpebrae* of Lindley. The plant from which the drawing was made flowered recently in the Garden of Mr John Lynam, of Calcutta, and was exhibited at the last Meeting of the Society Dr Anderson had recently collected several specimens of this Orchid in the Teesta Valley in British Sikkim

Drawings of two fine Araliaceæ at present in flower in the Botanical Garden were shown One of these, *Trevesia palmata* *Visiani* is rather common in the tropical forests of Sikkim, Bhootan, and Chittagong The other, a much fine, species *Trevesia Burmannica*, *T Anders* was sent to the Botanical Garden from ph by Dr Brandis

Both species were stated to thrive well in the open air in the Botanical

The acknowledgments of the Meeting having been accorded to Dr. Anderson for the above interesting remarks, the President requested him and Mr. S. P.

Griffiths to act as Jurors in respect to the plants sent in for competition They proceeded accordingly to the inspection and reported as follows —

To Mr Jennings —Two marks each for four new Caladia, and one mark for *C picturatum*

To Mr Grote - Two marks for his excellent large block of *Vanda teres*

To Mr Mowbray —Ten marks for a good specimen of the rare Orchid, *Cœlogyne Schilleriana*

Mr Ter Veen's collection —A good collection of seven kinds of *Caladia*, much admired No new kinds in this collection, but the plants are very fine

Rajah Sutt Shurn Ghosal—Deserves commendation for a collection of well grown Caladia

The collection of Plants exhibited on this occasion was considered an encouraging commencement of these Monthly Floral Exhibitions

Read the following letter from the Secretary, Government of Bengal, dated 12th April, and its enclosure, together with a specimen of the cocoons of the wild silk yielder referred to therein —

In forwarding to you the accompanying copy of a letter, dated the 1st Instant, from Baboo Bhyrub Chunder Potter of Ourbutah together with the specimen of cocoons therewith enclosed bringing to notice his discovery of a new description of silk cocoons growing in the Maunbhoom district, I am directed to request the Council of the Agricultural and Horticultural Society to favor the Lieutenant Governor with an expression of their opinion on the quality and utility of the cocoons now forwarded

To

THE SECRETARY, GOVERNMENT OF BENGAL

SIR,

I HAVE the honor to inform you that while I was Inspector of Police of Maunbhoom, I discovered on a certain hill of the district, a kind of new silk cocoons, growing in a state of nature on a species of trees, which are called by the inhabitants of the place *Passotree*, the leaves of which, it is natural and reasonable to suppose, must form, if not the sole, at least the principal, food of the worm which form these cocoons

I have since come to know that these cocoons are not produced every year, but after an interval of four or five years when they are found in such abundance that they sometimes amount to a thousand maunds

Some time subsequent to the period of my new discovery I sent a quantity of the new article to the late Calcutta Agricultural Exhibition

Moreover, specimen of the said production was sent to Mr Lottern, who is assisted by the Government in his enquiries after all sorts of new cocoons, and who considered it as essentially different from any that had been hitherto brought to notice. This gentleman succeeded in spinning my cocoons into fine silk, and directed me to supply him with a considerable quantity of the article that he might send it to Europe, desiring me in the meantime to purchase a thousand acres of land to be planted with the trees on which these cocoons worms are found to grow

I have at different times assisted him in his enquiries and furnished him with every information connected with them, but being a poor man myself, and the cultivation of the trees, and the procuration and breeding of the worms difficult and expensive, I have not been able to act up to his direction

Now, the object of my bringing the above particulars to your notice is, that you will be pleased to adopt such measures as will turn my discovery to account and practical utility, and if it seem to be of any value in your eyes, and prove in after times of any benefit to the State, I humbly hope I, who can justly claim the right of discovery, shall not be passed unnoticed or be left unbenefited

Trusting you will be kind enough to pardon me for any offence that I may have given by writing you these lines, and to lay my case before his Honor the Lieutenant-Governor of Bengal, for his favorable consideration,

Dated Gurrpeerah, }
The 1st April 1867 }

I have, &c
(Sd) Bhoyrub Chunder Potter

In reference to the above the Secretary submitted cocoons received three years ago from Mr Grose of Ranchee, exactly similar to those now forwarded by the Government of Bengal He further mentioned that cocoons of *Cricula trifenestrata*, probably a closely allied variety to that from Maunbhoom, if not identical, were forwarded by Col Haughton from Moulmein about ten years ago (*Journal, Vol* X, *page* 100) It was agreed to apply for a larger quantity of these Maunbhoom cocoons to enable a fair trial to be made for winding off the silk

Communications were read —

From Dr J L Stewart forwarding the first portion of a paper on the Flora of the Salt Range of the Punjab (Transferred for publication in the Journal)

From Dr Geo Henderson Secretary, Agricultural and Horticultural Society, Lahore, enquiring whether the Society has received any account of trials on an extended scale with the Europe Larch in the Himalaya Dr Henderson observes —

"I know of two cases in which a few trees were grown, but I am not aware that Larch has ever got what may be called a fair trial at different elevations and at different latitudes along the Himalayas There can be no doubt that if Larch will grow in any part of the Hills it will be a most valuable acquisition, because the tree so soon comes to maturity, or at least to be of such a size that the timber can be utilised For railway sleepers and as beams for houses, I know of no tree likely to equal it, and it stands exposure to alternations of wet and dryness better than most woods · it remains to be seen however if it keeps off white ants as well as Deodar. This month I received about 100 lbs. weight of Larch seed which germinated freely in ten days after a trial sowing was made. I have sent packets of the seed to all the Hill stations, along with printed directions for treatment, and if the seed germinates as freely in the Hills as it has done at Lahore, we ought to know pretty well by next autumn whether or not the Larch is *likely* to thrive in the Himalayas. In Scotland, it is found that Larch favors the growth of grass so much that the improved pasturage almost pays the expense of planting.

I send you a copy of the printed directions I sent with the seed, and shall be glad if any Member of the Society will inform me about former experiments of the same kind. Any Members of the Society who wish a packet of Larch seed, I shall be happy to supply."

The following are the directions alluded to —

"Larch will *probably* not thrive in India under 6,000 feet above the sea.

The seed should be sown between 1st May, and 1st August, but I think that early sowings are most likely to be successful.

On the small scale, the seed may be sown in pots. On the large scale in a nursery bed, in rows 9 to 12 inches apart at right angles to the slope and without any manure, it should be *very* lightly covered with earth say $\frac{1}{16}$th of an inch or less. Transplant the seedlings, when 1½ inch high, into a nursery at 12 to 18 inches apart, and plant them out where they are permanently to remain, when 9 to 12 inches high.

As seedlings are apt to be killed in transplanting, a good plan on the small scale, is to put them singly into small pots, for 10 or 15 days, and keep them slightly shaded, then to turn them out into the nursery, with the balls of earth entire.

Avoid transplanting during the summer and rains, *probably*, November will be the best month, after the leaves fall; or in spring, just before the leaves appear.

In Europe, Larch grows best in rocky situations, and on poor soil, with rock near the surface.

Water lodging about the trees is very injurious, therefore the nursery, as well as the permanent site, should be on a slope, to carry off superfluous water, and cross drains should be made at intervals, to prevent too great a rush of water in the rains.

Larch seed is sometimes sown where the trees are to remain, thus, on a hill side, small patches of ground, 12 to 18 inches diameter, are dug and levelled, at intervals of six feet; a few seeds are scattered on the surface, and watered occasionally, if necessary. If this method is adopted, the ground must be thoroughly fenced, and care taken that the young trees do not get choked by weeds; where several trees spring up on one spot, they may be thinned out, when 1½ to 2 inches high, to fill up blanks. Ground which has been cultivated, is not generally found to suit Larch so well as that which has never been under the plough.

Shade may be necessary for the young plants in situations where the sun s rays are very powerful, but more harm is likely to result from too much shade, than from its entire absence There are then four points to be attended to —

1 Cover the seed *very* lightly with earth
2 Water sparingly until the seed begins to germinate
3 Prevent stagnant water collecting about the plants
4 Plant out on rather poor soil, in rocky situations and on a slope

We know so little about the proper treatment of Larch in the Himalayas, that the results of experiments in different soils, and situations, will be most valuable, for future guidance The directions here given, it is believed, will give a fair chance of success, if Larch can be grown in India

Should the seed germinate, it is very desirable that a report should be made after a few months And to allow of different experiments being compared, I would suggest that after noting the elevation date of sowing &c, an observation be recorded on the 1st and 15 of each month as to the general appearance of the plants, their size, the portion of deaths effect of heavy rain, or hot sun, &c And at the end of six months, that an abstract of these observations be sent to the Secretary of the Punjab Agri Horticultural Society

From Arthur Foy Esq, Luckimpore, Oude, on the subject of Weevil —

"Can you oblige me asks Mr Foy, 'with any information regarding the storing of grain as done in parts where water is near the surface,—say 6 to 10 feet below —which is most successful in preserving it from weevil I enclose the insect I wish to secure myself against its ravages next year —I hear it is quite secure if it could be buried under ground in *khuttas*, where it may be for years Above ground we have had Bandecootes and Rats to contend with We then put it out on walled racks, 2 feet above the surface there even we could not save from Weevil To us Farmers every hint on this subject is of the *deepest importance* '

The Secretary mentioned he had afforded Mr Foy all the information possessed by the Society, but would be glad for any further particulars, based on experience, where water is near the surface

From Messrs Mosley and Hurst placing at the disposal of the Society, half a hundredweight of Sea Island Cotton seed which they are informed, is of the best description

Ordered, that this be immediately advertised for distribution

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(Wednesday the 22nd of May, 1867)

A GROTE, ESQ, *President, in the Chair*

THE Proceedings of the last Meeting were read and confirmed

The Gentlemen proposed at the last Meeting were elected Members, *viz* —

Dr J P Brougham, Baboo Essan Chunder Sircar, C S, the Rev E Kemble, Lieut.-Col R C Tytler, the Hon ble A G Macpherson, Lieut. W J Williamson, Baboo Woopendercoomer Mittra, Messrs. F. R. Browning, C. E., Geo. Smeaton, C. S., and C. E. S. Innes.

The names of the following Gentlemen were submitted as candidates for election:—

Lieut. Wm. John Pickance, Madras Staff Corps, Assistant Superintendent of Police, Ganjam District, Chatterpore,—proposed by Mr. F. J. V. Minchin, seconded by the Secretary.

W. P. Duff, Esq., Merchant, Calcutta,—proposed by Mr. W. Stalkartt, seconded by Mr. J. A. Crawford.

C. G. D. Betts, Esq., Ourungabad, *via* Pakour,—proposed by the Secretary, seconded by Mr. R. Blechynden.

James H. Hutchinson, Esq., Calcutta,—proposed by Mr. S. Jennings, seconded by Mr. S. H. Robinson.

Irwin J. Whittey, Esq., C. E., E. I. Rail[illegible] Chord Line, Sapha,—proposed by Colonel J. R. Abbott, seconded by the Se[illegible].

Alexander L. Webster, Esq., Manag[illegible]orid Concern, Jorehaut,—proposed by Mr. T. H. Lawrie, seconded by [illegible]wrie.

Wm. Albert Dixon, Esq., Soonarie Factory, Seebsaugor,—proposed by Mr. T. H. Lawrie, seconded by Mr. A. Lawrie.

Alexander Gair, Esq., Merchant, Rangoon,—proposed by Mr. J. Gordon, seconded by the Secretary.

Lord Ulick Browne, C. S., Kishnaghur,—proposed by Major W. N. Lees, seconded by Mr. Grote.

J. Thomas, Esq., Merchant, Calcutta,—proposed by the Secretary, seconded by Mr. R. Blechynden.

The following contributions were announced:—

1. Memoirs of the Geological Survey of India, *Palæontologia Indica*, Vol. 1-4.—presented by the Superintendent, Geological Survey of India.

2. Annual Report of the Geological Survey of India, 1866-67,—presented by the Superintendent.

3. Annual Report of the Cape of Good Hope Agricultural Society,—from the Society.

4. A Wardian case of plants from Honolulu, presented by Dr. Hillebrand. The Gardener reports that not more than ten of this large collection of plants have reached alive. Further particulars to be given hereafter. He further reports that most of the seeds presented by Dr. Hillebrand in March last have germinated freely.

5. A few seeds from New Zealand,—presented by Mr. S. H. Robinson, on behalf of Mr. Johnson of New Zealand.

6. A small collection of seeds from Australia,—presented by Mr. John Weinholt.

7. A varied assortment of seeds from Melbourne,—presented by Mr. H. J. Butler.

8 A packet of seeds of the new creeper "Federicka Guillaumi,"—presented by Mr George Bartlett

9. A few seeds of *Myrospermum Pereiræ*,—from Dr J D Hooker

10. Ten plants of seven kinds of *Caladia*, of new varieties,—presented by Mr S Jennings

EXHIBITION OF RARE PLANTS.

The Secretary read the following list of plants sent in for competition —

From Rajah Sutt Churn Ghosal's Garden —A plant of *Eurycles Amboinensis*, one of *Crinum latifolium*, Roxb, two of *Agapanthus umbellatus*, and one of *Ærides odorata*

From Mr Grote's Garden —A plant of *Phalænopsis amabilis*, one of *Ærides Lobbii*, one of *Ærides affine*, one of *Sarcanthus* species, one of Perennial-Phlox and two of *Hemerocallis flavus*.

From Mr Samual Jen[illegible]den —A large plant, in full flower, of *Dendrobium calceolaria* a plant [illegible] of *D* [illegible] and 8 plants of *Caladia*, including three new kinds, [illegible]*tii*, *C rubro maculata*, and *C pictum*

From Mr John Lynam's [illegible]n —A plant of *Dendrobium refractum*, Teij's et Binnend, and one of *Ærides affine*

From the Health Officer Dalhousie Square Garden— Two plants of *Phalænopsis amabilis*, two of *Ærides odorata* one of *Saccolabium guttatum*, one of *Vanda teres*, two of *Dendrobium* [illegible] one of *Cymbidium aloifolium* one of *Epidendrum crassifolium*, one of *Dendrobium* [illegible] one of *Ærides affine* one of *Æ affine* var, one of *Crinum latifolium* one of *Funkia cordata*, one of *Nepenthes distillatoria*, a *Gloxinia* and a *Begonia*

From Mr A Mowbray's Garden —A plant of *Luisia trichorhiza*

From the Royal Botanic Garden —A plant of *Dendrobium nodatum*, of *D Wallichii*, of *Alocasia argyroneura* and 1 of *Begonia* species from Punkabaree

From the Society's Garden —Fourteen kinds of *Caladia*, in fine condition, 5 *Begonias* of sorts one *Pandanus* species from Queensland *Hibiscus* species (from seed from Australia—presented by Major J C Dickson in March 1865,) and an *Achimenes* (Princess Charlotte)

On the requisition of the President, Dr Anderson and Mr S P Griffiths acted as Jurors, and submitted the following report —

To Mr Grote —Two marks for his well-grown plant of perennial *Phlox* (white flower).

To Mr Jennings —Five marks for his splendid example of *Dendrobium calceolaria*, in full flower, and six marks for his three new Caladia, viz, *C Brongniartii* *C rubro-maculata*, and *C. pictum*

To Mr Lynam —Four marks for his *Dendrobium refractum*

To the Health Officer —Three marks for the fine well-grown plant of *Funkia cordata*

Dr Anderson offered a few remarks on Mr Jennings' fine *Dendrobium* which he stated to be *D calceolaria*, Hooker, a very different plant from *D calceolum*, the name placed on the label. Dr. Anderson also called attention to a spike of *D. moschatum*, which, it would be seen, is very different from the plant which has sometimes been so named. Dr. Anderson promised to draw up a short note on *Dendrobium calceolaria* and its synonymes, for submission at the next Meeting.

Increasing demand in the English market for the Chinese Grass or "Rheea" of Assam.

The Secretary submitted copy of a despatch from the Secretary of State, and the Report from the American Vice Consulate, Bradford, therein alluded to, in reference to the extended growth in India of the plant yielding the so called "China Grass," which is identical with the "Rheea" of Assam and the "Kunchoora" of Rungpore and Purneah The Secretary, in remarking on the excellent sample of "Rheea," which was recently submitted by the Messrs. Morrell, as the growth of Buckergunge, drew attention to the interest which the Society had taken in this fine fibre for many years past, and the various papers on the subject which had been published in the Journal. The expense of separating the fibre from the stalk had proved a great obstacle to its introduction into the English Market, at a moderate cost; all attempts hitherto made with this object in view had, it would appear, proved unsuccessful.

Resolved,—That these two documents be published in the proceedings of this day's Meeting, with the view of keeping up a feeling of interest in this important staple.

From the Earl of CRANBORNE, *to His Excellency the Right Hon'ble the* VICEROY *of India in Council, dated 7th March* 1867.

SIR,—I transmit to your Excellency in Council thirty copies of a Memorandum, by Mr. McClintock, American Vice-Consul at Bradford, respecting the manufacture of China Grass, and the price which can be obtained for it in this country, which I have received from Her Majesty's Secretary of State for Foreign Affairs.

2 Lord Stanley, in transmitting this paper, informs me that he has ascertained, through the Bradford Chamber of Commerce, that the importance attached by the writer of the Report to this article is not exaggerated, and that nothing but its high price stands in the way of its being largely consumed.

3. Under these circumstances, I agree with the Secretary of State for Foreign Affairs that it will be useful to forward copies of the Report to any of the Officers of your Presidency who reside in places which may be favorable to the cultivation and export of this grass.

From ARTHUR HOWELL, *Under Secy to the Govt. of India, Home Dept*, *No.* 4,160 *dated the April 22nd*, 1867.

Copy of this Despatch, together with three copies of the Report referred to, forwarded to the Secretary, Agri Horticultural Society for information.

Report by Mr. McClintock, American Vice-Consul at Bradford, respecting the Manufacture of "China Grass."

CONSULATE OF THE UNITED STATES, BRADFORD,

December 15th, 1865.

"The Chinese have for centuries made, by hand labour, various descriptions of "grass cloth," well known in America and Europe, and often of great strength and beauty, from the fibre of the *Boehmeria cordata, Urtica nivea*, known in commerce as Chinese grass.

Large quantities of the grass have at various times been brought over to England, and probably also to the United States, in the hope of finding a market among the dry goods manufacturers who are always on the look-out for new materials; but it has hitherto been, and it is even now, found impossible to produce a true "grass cloth" by machinery. The fibre is rather brittle, though very strong, and it is found that the China grass cloth of commerce is only to be woven by hand labour, in which, of course, the Chinese themselves are beyond the reach of competition. Large quantities of the grass have, therefore, been in store in London and elsewhere for years. Some enterprising manufacturer would occasionally purchase a few tons with which to make experiments, but the only result for a long time was, that he who experimented the most lost the most. Thousands and even tens of thousands of pounds were sunk by one and another, who each fancied for a time that he had discovered the true method of working up this intractable substance. Whether it was tried in the United States or not, I do not know, but the concurrent testimony of American friends in the trade is, that no one is now successfully working it at home. Within two or three years past, however, several firms in this neighbourhood have succeeded, by chemical means, in bringing the fibre into a state most closely resembling the best mohair or other bright worsted, and have worked up great quantities of the refined material as a substitute for worsted in many kinds of stuff goods, always, however, in combination with cotton (the warp being of cotton and the weft of the China grass), as they have not yet been able to work it properly alone.

The manufacture of worsted good—that is, of goods made of long-staple or ordinary wool—has become an immense trade, of which Bradford has at present almost a monoply, although the manufacture has lately been extending in many parts of New England. Four-fiths of these goods are of mixed material —that is, are made with cotton warps. And for many articles of the kind, specially for those requiring a stiff, strong, and cool texture, combined with a glossy, silky appearance, it is found that the prepared China grass makes the very best material.

Of course, the grass manufacture is yet in very few hands, but its development already, even within the last few months, has been signally rapid. The market value of the raw material has for some years past maintained itself at the very high rate of about 80*l.* per ton, which price it is supposed cannot be much lessened for many years to come. Two things are certain in this respect one, that there is now, and will be here, a practically limitless market for all the raw "grass" that can be imported at from 70*l.* to 80*l.* per ton; the other, that under any fluctuations of the market the material is intrinsically so valuable, that it will always in the future command a price as high as that of cotton, and nearly or quite as high as that of worsted itself, if not even higher.

Here, then, is a great and rapidly increasing market for a certain vegetable production at a very high price. In America we have, on the other hand, vast tracts of country which, being in the same latitude, and with very much the same climate as those districts of China of which the grass is native, should be able to grow this production to great advantage. Why not, then, introduce its culture?

It seems certain that the manufacture of the grass fibre will be established in our country at no distant day; but in the meantime there is a market in England for all that we can conveniently grow. It is, for our planters, simply a question of experiment with the seed, having in view the market price of the raw product. Successful experiments have been made very recently in Java and in India, proving that the grass will grow in any climate warm enough for the culture of cotton and sugar, provided the ground chosen be sufficiently moist.

I venture to suggest that further information, as well as quantities of the seed, &c., can doubtless be furnished by our Consular Officers in China, especially perhaps, by the Consul at Hankow, that place being the chief market for the grass, which is brought thither from the interior, and often from a great distance."

In connection with the above the Secretary read extract of a letter from Dr. Hooker, forwarding a copy of Mr. McClintock's report, and asking for some information in respect to the manufacture of this fibre, and its export, &c. Applying also for a box of cuttings, as the late severe weather in January had killed the plants in the Kew gardens. The Secretary mentioned that he had given the required information and forwarded a Wardian case of plants by the last Steamer.

NOTES AND QUERIES.

Read the following letter from Mr. A. Eliott Russell, of Burdwan —

"I am glad that you are favorable to my idea regarding Notes and Queries. We are sadly in want in this country of some mode of communicating with others on questions of Horticultural interest. In almost all stations there will be found some one who is fond of horticulture, but it is very seldom that there is any chance of getting much assistance from others in the Mofussil.

I think that the Monthly Meetings of the Society, which appear to be popular, presents a very good opportunity for producing questions on points regarding which Members require enlightenment, and it is to be hoped that the Calcutta amateurs who have made such great advances in horticulture will not grudge the trouble of assisting their Mofussil brethren by answering such queries according to their own experience.

I now send the following Queries which I shall be glad of answer:—

1st.—Should plants of *Richardia Ethiopica* that are still in vigorous growth, but which show no signs of flowering at present, be allowed to grow on, or should they be now starved and allowed to die down?

2nd.—Is it usual to find much difficulty in growing *Achimenes* in Bengal? Mine die down after they have formed a few leaves, and appear to be unable to stand the dry heat of a northern verandah where they are quite sheltered from actual sunshine although they have been sufficiently watered. Is there any way of preventing them from dying down in this manner?

3rd.—Is it possible in a Bengal climate to keep seedling Geraniums alive through the rains? Those that I have turned very white during the hot days that we had at the beginning of this month, but after a day or two of moist weather their seed shoots are better in colour. I fear that they will damp off during the rains, as they do not look particularly healthy. Is there any way to prevent their suffering from damp?

If my humble endeavour lead others to take up the question of establishing something in the way of Notes and Queries, I shall be very glad. Nothing would be more useful, I am sure, to those who are interested either in horticulture or any branch of natural science than a publication of the kind.

The President remarked that he hoped the example set by Mr. Russell would be generally followed, as it would probably tend to elicit a considerable body of useful information from various parts of the country.

COMMUNICATIONS ON VARIOUS SUBJECTS.

The following letters were also submitted:—

1.—From W. S. Halsey, Esq., Cawnpore, advising despatch of a maund of acclimatized Cotton, cleaned by Carver's Saw Gin:—

"I have ordered"—writes Mr. Halsey—"a maund of the cotton which my brother cleaned in Carver's Gin, and which I grew on our model Farm land, to be sent to you.

I regret, however, that I cannot send you any of the indigenous cotton cleaned by Carver's Gin, as Messrs. Palmer & Co.'s firm being shut up, we have no longer any steam power available for working the Gin, and my brother appears only to have cleaned a sample.

With regard to a supply being obtainable of this Dharwar Cotton, I am sorry to say there is none at present, but I am offering every inducement to the zemindars of my district to cultivate it, and I hope in the course of a couple of years to create a regular supply.

There are great difficulties in the way—native indifference, and the want of water.

Where there is a canal supply I have no doubt it will eventually be introduced, but I have yet to study the effect of sowing it on the high lands in the neighbourhood of the Jumna, and to ascertain what return it will give without the assistance of irrigation.

I am just going to begin picking my second crop from the plants which produced the Cotton sent to you, and which was sown in the end of June last year."

Resolved,—That, as agreed on at the March Meeting, this Cotton be equally divided between the Goosery Cotton Mills and Fort Gloster Mills, and that they be requested to favor the Society with a report thereon.

2.—From Assistant Secretary, Government of Bengal, forwarding copy of an abstract of M. Van Gorkum's official report on Cinchona cultivation in Java in 1864.

3.—From Junior Secretary, Government of Bengal, forwarding copy of Circular No. 2, from the Inspector General of Forests, with a synopsis giving short characters of the Pines and other Conifers of the N W Himalaya.

4.—From Secretary, Cape of Good Hope Agricultural Society, dated 15th February, acknowledging receipt of certain copies of this Society's Journal and applying for seeds, &c.

5.—From Messrs. James Carter and Co., enclosing invoices of two consignments of Vegetable and Flower-seeds per *City of Lahore* and *West*.

For the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, the 19th of June, 1867.)

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz.* :—

Lieutenant W. J. Pickance, Messrs. W P. Duff, C. G. D. Betts, James H. Hutchinson, Irwin J. Whitty, Alexander L Webster, Wm. Albert Dixon, Alexander Gair, J. Thomas, and Lord Ulick Browne.

The names of the following Gentlemen were submitted as candidates for election :—

J. D. Gash, Esq., Indigo Planter, Horrowah Factory, Benares,—proposed by Mr. C. F. Pittar, seconded by the Secretary.

Major W. R. E. Alexander, Commanding 1st Bengal Cavalry, Nowgong,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Walter Williams, Esq., Superintendent, District Police, Etah,—proposed by Dr. J. W. Tylor, seconded by the Secretary.

S. Wright, Esq, Principal Sudder Ameen, Dinagepore,—proposed by Dr. A. Fitzpatrick, seconded by Dr. Woodford.

Walter James Law, Esq, Tea Planter, Seebsaugor,—proposed by Mr C H. Lane, seconded by the Secretary

H J Place, Esq, Broker, Calcutta,—proposed by Mr Jennings, seconded by Mr Galiffe

Coomar Greeschunder Sing, Calcutta,—proposed by Mr S P Griffiths, seconded by Baboo P C Mittra

The following contributions were announced —

1 —A small assortment of acclimatized flower seeds, and Latakia Tobacco seed,—from the Agricultural and Horticultural Society, Lahore

2 —Samples of Pissee and Kuttea Wheat from the Nursingpore District,—from the Commissioner of the Central Provinces

3 —One hundred pounds of acclimatized Carolina Paddy,—from the Agricultural and Horticultural Society of Madras

"This Paddy is all acclimatized," observes Dr Bidie, "and has been collected in small quantities, the demand for the Paddy being very great The success which has attended its cultivation in some Districts has been very remarkable Let me give one instance Sir G U Yule, late Resident at Hyderabad, got from me last year 4lbs of seed, which he sowed in his garden there, and the return from that small quantity amounted to no less than 900lbs of clean Paddy! I do not think that anything like this has been realised either in this country or even America"

The Secretary announced that no time had been lost in distributing this paddy to 25 Members (whose names had been previously registered) in packet of one, two, and three seers, respectively, resident at Rajmehal, Beerbhoom, Furreedpore, Tipperah, Dacca, Bancoorah, Purneah, Maunbhoom, Chittagong, &c The report from the Gardener was not, however, very favourable only 40 per cent had germinated

4.—A sample of Cotton grown in his Garden at Alipore, from Major Clarke's' seed,—"hybrid between Sea Island and Bourbon, some 18 months ago,—from Mr. Grote (Referred to the Committee for report)

Lists were submitted from the Gardener of fruit grafts now available, as also of certain kinds of ornamental plants, such as Roupellias, Gardenias, Ixoras, Passifloras, Plumerias, Jacquinias, Allamandas, Beaumontias, Abutilon, Malpighias, Barlerias, Parsonsias, Colvillia, Caladiums, Achimenes, Bignonias, Heliotrope, scarlet Geranium, &c, &c

Reports were also placed on the table on the germination of seeds received from Dr Hillebrand from the Sandwich Islands, Dr Hooker from Kew, and Mr John W'enholt's small collection of Australian Seeds.

FLORAL EXHIBITION

The Secretary read the following list of plants sent in for examination —

From Rajah Sutt Churn Ghosal's Garden —Several pots of *Caladia*, a collection of Ferns, a *Bromelia* with beautifully striped foliage, a perennial Phlox, in good flower, pink and white; and several other plants of a more common description.

From Mr. Grote's Garden.—Plants of *Aerides Lindleyanum, Clerodendron Thomsonæ and Calathea bicolor.*

From Mr. Griffith's Garden.—A well flowered plant of *Sprekelia formosissima.*

From the Health Officer, Dalhousie Square Garden.—Plants of *Renanthera coccinea, Phalænopsis amabilis, Saccolabium guttatum, Vanda teres, Acampe* species, *Nepenthes* and *Gladiolus.*

From the Society's Garden.—An exceedingly well grown plant in full flower, of *Arachnis moschifera.*

Mr. William Stalkartt placed on the table a very fine bunch of White Grapes.

Messrs. Stalkartt and Jennings as judges reported awards,—

To Mr. Grote of 8 marks for his splendid example of *Aerides Lindleyanum* and two marks for *Clerodendron* [illegible]

To Rajah Suttchurn Ghosal 2 marks for his Perennial *Phlox* and 2 marks for his *Bromelia.*

The Secretary submitted Dr. Thomas Anderson's remarks on *Dendrobium Calceolaria* Hook. as promised at the last Meeting. (Transferred for publication in the Journal.)

AGRICULTURAL STATISTICS.

The Council submitted the following Minute by the President, respecting the collection of information on Rice cultivation in India.—

"Some 3 years back I suggested for my Colleagues' consideration that we should appoint a Committee for the collection of Agricultural Statistics, the occasion being then favourable for pushing such enquiries owing to the encouragement held out by a letter dated June 1864 from the Official Statistical Committee, which was published in our Proceedings for July 1864 (*Vide Journal, Vol. XIII, page* 90, *Proceedings.*)

Probably my absence at Darjeeling in 1864 may account for my not having pressed the subject in the Council more heartily than I did at that time. It is one in which I have long been much interested and than which none can be more worthy of our Society's attention. No individual is ever likely to obtain such reliable and practical information on the numerous and varied products of this great country as our Society can command.

Our Circular last year in the matter of Tea culture was so successful that I have, with the aid of the Secretary and Baboo Peary Chand Mittra, drawn up questions intended to elicit similar information regarding the yield of rice, a staple of far greater importance than Tea to the masses in Bengal and one which is likely to be now cultivated more carefully than it ever was cultivated—in days not to return, I expect,—when the harvest of the field barely sufficed to pay its rent.

If the Council agree with me in the expediency of circulating these questions, we may usefully extend our enquiries hereafter to other cereals, and to the staple pulses."

The Secretary submitted a list of Members and others to whom copies of Circulars and Queries could be sent as a beginning

Agreed —and that a copy be sent to the Government of Bengal, and their assistance requested for circulation to Collectors of Districts

NOTES AND QUERIES

Read the following letter from Mr R D Stewart, on the subject of the Date Palm —

"I am glad to see from your last published Proceedings, that an example has been set by Mr Elliott Russell, of Burdwan, respecting "Notes and Queries," and I hope many will follow it As I am in want of certain information respecting the Date tree, will you have the goodness to submit the following at your Meeting this afternoon [illegible]

Have any attempts [illegible] made to introduce the Date tree of Arabia into Bengal? I should also wish to be informed if such introduced trees yield fruit equal to the Arabian Date, and if its saccharine properties have been found equal to the Indian Date? What process do the Arabian Dates undergo to preserve them?"

The Secretary mentioned that the culture of the Arabian Date (*Phœnix dactylifera*) was attempted many years ago a Patna by Mr T E Ravenshaw, the then Commissioner, but he was not aware of the result Mr Edgeworth also turned his attention to the subject in 1849 when Commissioner of Mooltan

The Secretary submitted a note by Mr Errington, the Society's Gardener, on the management of *Achimenes* in Bengal, in reply to the enquiry of Mr Elliott Russell made at the last Meeting

RESINOUS PRODUCTS IN THE LOWER PROVINCES

The Secretary submitted a letter from the Secretary, Board of Revenue, forwarding copy of the Boards Report to Government on the above subject

Resolved,—That the said report form a portion of this day's Proceedings, with the view of inviting attention to this important subject

TO THE OFFG SECRETARY TO THE GOVT OF BENGAL,

Fort William, the 8th June, 1867.

A. GROTE,
V H SCHALCH, } ESQRS.

WITH reference to your letter No 2617, dated the 18th September 1866, and subsequent reminder, No 793, dated 25th February last, calling for a report on the resinous products procurable in the Lower Provinces of Bengal I am directed by the Board to forward herewith copy of Board's Circular, No 1712, dated 26th September 1866, with enclosures, together with an abstract of the reports which have been received on the subject from the several Commissioners of Divisions.

2. This Abstract shews that the Divisions of Cuttack, Patna, Chittagong, Chotâ Nagpore, and Assam can alone be with any certainty reported as likely to afford traders an opportunity of enlarging the trade of this Presidency in resinous products.

3. Specimens of the resins and gums referred to in the reports were for the most part sent to England in 1862, as will be seen by turning to Mr. Dowlean's official catalogue of contributions from this country to the Exhibition, pages 47-49. Some information on these products will also be found in Vols. IV. and V. of the Agri-Horticultural Society's Journal.

4. From Assam very full information has generally been received, but it does not show that much increase to the resin trade can be there looked for. The principal products appear to be shell-lac and cutch, the other numerous gums mentioned not being apparently produced in any large quantities.

5. A Tabular Statement has been drawn up, copy of which is annexed shewing the exports of resinous products from Calcutta since the first year (1859-60) of the period to which the Secretary of State refers. As regards shel-lac and lac-dye, it would appear that up to 1865-66 the trade did increase appreciably year by year, but in 1866-67 it was evidently and suddenly checked, though this may have of course been the result of the general depression in trade. The trade in cutch has, on the other hand, steadily decreased, though it is one of the articles which, according to the Commissioner's reports, is easily procurable. Again, the average market values in each year do not appear in any way to have followed the great rise which has taken place in the English market as noticed by the Secretary of State.

6. On the whole it would appear that the state of the English market has not affected the trade in these products, in regard to their use as resin or tar. Whether it may in future be expected to do so must practically depend upon the action of those traders in the country who find it to their interest to collect such products for the Calcutta market For general information the present correspondence may be suitably published in the *Gazette*

7. Further reports, it will be observed, are expected from the Commissioners of Chotâ Nagpore and Assam, which, if necessary, will be submitted by the Board, in continuation of the abstract now forwarded.

From T. B. LANE, ESQ., Secretary to the Board of Revenue, Lower Provinces, to all Commissioners,—(No 1712A, dated the 26th September 1866)

SIR,—I am directed by the Board of Revenue to forward herewith, a copy of a Circular No. 11, dated 30th August 1866, from the Secretary to the Government of India, Public Works Department, and to request that you will submit, without delay, a report on the resinous products procurable in your Division.

Circular from LIEUTENANT-COLONEL, C. H. DICKENS, R. A., Secretary to the Government of India, Public Works Department, to ,—(No. 11, dated Simla, the 30th August 1866)

SIR,—The deficient supply of resin and tar, occasioning loss and inconvenience to manufacturers in various branches of trade, having attracted the attention of Her Majesty's Government, a Circular Despatch was addressed by Earl Russell, on 9th August 1864, to Her Majesty's Consuls, in which attention was called to the alarming decrease in the quantities of these articles imported into Great Britain since the commencement of the late war in America Large supplies were formerly derived from the Southern States

2 The reports have been lately printed in a Blue Book (June 1865), and the following figures have been obtained from the Trade Returns —

IMPORT

	Cwts	Values
In 1859	1 143 452	£ 470,447
,, 1863	412 731	£ 560,289

3 Thus, while the supply in the year 1863 was not much more than one-third of what it was four years previously in 1859, the price had more than trebled

4 Under these circumstances, it seems probable that India may derive profit from turning her attention to this branch of industry, and the Governor-General in Council is of opinion that reports might be called for with advantage regarding the quantity, quality, and value of the resinous products procurable in the different Provinces, to be submitted with any further information which the Local Governments and Administrations may be able to furnish, and I am directed to request that you will be good enough to give effect to the wishes of His Excellency in Council Of the common *resin* of commerce, the produce of coniferous trees, there is none available (it is doubtful if it could be exported with profit from the outer Himalaya) and turpentine is not manufactured, but there are many valuable dammers, balsams, and gum resins found in the forests of Hindustan, Burmah, and the Malayan Peninsula, which are habitually exported to Europe, and which, it may be presumed, might be supplied to an almost unlimited extent

Memorandum from A MACKENZIE, ESQ, Officiating Under-Secretary to the Government of Bengal,—(No 2617, dated the 18th September 1866)

COPY forwarded to the Board of Revenue with a request that they will institute the necessary enquiries through Commissioners of Divisions and report the result for the information of Government

RESINOUS PRODUCTS.

Commissioner of Cuttack, No 826, dated 6th October 1866.

Reports that the only resinous product of the Cuttack Division is the *dhoona* or gum of the *sal* tree, which is chiefly found in the adjoining Hill states of Pal Lehra, Talcheer, &c It is obtained by girdling the tree, but this process involves great destruction of timber. States he has advised the Hill Rajahs to adopt the process of tapping instead, the effects of which are not injurious to the trees. The probable quantity annually collected is not known, but about 5 to 8,000 maunds find their way to Cuttack and Balasore, nearly the whole of which is exported to Calcutta The market price varies with the quality of the article from Rupees 4-4 to 6 Rupees per maund.

2 The *Khyr* or *Catechu* is also exported It is obtained by boiling the wood and the bark of the tree from which it is produced, but it forms no important article of trade

Commissioner of Rajshahye, No 691, dated 24th November 1866

Reports that there are no resinous products procurable in the Rajshahye Division

Commissioner of Dacca No 1185, dated 7th December 1866.

Reports that in the Sylhet District a tree called *Mabud* is grown on the Hills to the south, which produces a kind of resin, of which about 200 maunds per annum might be collected It is sold at Rupees 3-8 and Rupees 4 per maund, but is not of a good quality, and is only burnt by the people for its fragrance

2 In Dacca the fruit of the *Gab* yields a gum exclusively used in caulking boats, and the tree might be grown to any extent

3. On the whole the Collectors report that the resinous products of the Dacca Division are not such as could with advantage be made the subject of exportation

Commissioner of Patna, No 688, dated 21st December 1866

Reports that in the Gya District the *lac* is obtained from the spontaneous exudations of the *Byr* or wild plum tree, the *dhoona* formed from the extracted juice of the *sal* tree, and the *kuth* which is obtained by boiling the bark of the *khaikur* tree These resins are said to be brought from Imamgunge and Rajowlee in the Shergotty and Nowadah Sub-divisions. The supply from these places is estimated as follows, viz —

Immagunge	*Lac*	*Dhoona*	*Kuth*	
	Mds	Mds	Mds	
Shergotty Sub division .	7,000	5,000	4000	and
Rajowlee.				
Nowadah Sub-division	5,000	4,000.	. .	

The town of Gya carries on a considerable trade in *lac* and *dhoona* with Calcutta, Patna, Arrah, Chupra, Mozufferpore and Mirzapore, and also in *kuth* with the last-named place, the prices of these resins are—

Lac	.	Rs 6 to 12	per maund,
Dhoona		„ 4 to 8½	„
Khut	... ...	„ 4 to 9	„

and states also that the Collector of Gya thinks these resins may be found in the forests of Pergunnah Belonjeh, in the Sub-division of Aurungabad.

2 In the Sasseram Sub-division, in Shahabad, Mr C E Davies, a gentleman who had made the botany of the place his study, reports that there are two

resin-producing trees, and one from which oil is made (1) the *mukhwah* tree (Shorea robusta) producing *dhoona* (Resina Bengalensis), (2) the *sal* tree (Boswellia, serrata) yielding *alibownm*, and (3) the *Rabusa sedge* (Testuca fusca) producing the Nomar or Rabusa oil, of these, however, the second is only collected for trade.

3 In the Patna District the only resin procurable is *lac*, but the supply is so very inconsiderable as to deserve no notice In the districts of Tirhoot, Sarun and Chumparun, it appears that no resinous products are procurable

Reports that no resinous products are procurable in the districts of Chittagong, Noacolly, and Tipperah

Commissioner of Chittagong, No 70t, dated 31st December 1866

2 In the Hill Tracts district, a gum or oily resin, extracted from the *gurjun* tree, is regularly brought to market The quantity brought thither is unknown, but from the enormous tracts of forests covered by this tree the possible supply must be very large It is chiefly used for caulking boats, varnishing mat walls ceilings &c A resinous gum is also extracted from the *neem* or *naggesur* trees, but this forms an insignificant article of trade

Commissioner of Chota Nagpore, No 38, dated 4th January 1867

Reports that a very considerable quantity of *dhoona*, produced from the *sal* tree is annually collected in the Tributary Mehals, the Chiefs of which are unable to inform him as to the quantity obtained The district officers of Lohardugga, Singhbhoom and Maunbhoom estimate the quantity exported annually from their Districts as follows —

	Mds.		
Lohardugga, including Palamow	1,600		
Singhbhoom	500	to	600
Maunbhoom	128		
Total	2,228	to	2,328

2 The value of the exports from Singhbhoom is estimated at 1,400 Rupees or about 2 Rupees 4 annas per maund States he will report again on the subject on obtaining better information

Commissioner of Burdwan, No 490, dated 9th January 1867

Reports that no resinous products have been discovered to exist in Beerbhoom, Burdwan and Howrah In the districts of Bancoorah, Hooghly, and Midnapore, a small quantity of resin is extracted from the *sal* trees growing in the jungly parts, and in Midnapore specially there is a very steady but unimportant trade in the produce. States he has no doubt that resinous products might be procured from certain trees in the jungly parts of his division, but the reports received by him from the several Collectors are at the best very meagre

Commissioner of Bhaugulpore, No 414, dated 28th January 1867.

Reports that no resinous products are procurable in his division, save in the district of Monghyr, where *dhoona* (dammar) and *Gond* (Gum) are produced to some extent in the

Pergunnahs of Chuckye, Gedhore, and Khurruckpore. In the jungly portion of the other Pergunnahs of this district, gum is obtained from the *Babool*, *Paras Seemul* and *Neem* trees. It is not of the very best quality, and sells from Rs. 8 to 10 per maund The dammer alluded to above is produced from the *sal* trees, and is reported to be of a very fair quality, selling from Rupees 4 to 10 per maund.

Commissioner of Assam No. 616, dated 6th February 1867.

Kamroop.—The Deputy Commissioner reports that with the exception of "shell-lac" there is no regular trade carried on among the resinous products of his district, nor has he been able to ascertain satisfactorily the actual quantity obtainable. With reference to *shell-lac* the resinous substance of which is combined with much colouring matter, is produced by the puncture of the female of a small insect called the *Coccus lacca* on the young branches of certain trees found in the District. A very fair trade is carried on in *shell-lac* to the extent of about 4 to 5,000 maunds a year, the manufacture of which might be doubled, if an impetus were given to the trade. The quantity exported is considered valuable; it commands at times as much as 25 Rupees a maund, and the *lac-dye* manufactured from the shell-lac is far more valuable.

2. The *sal* tree yields a resinous gum which sells for a Rupee a seer in the bazar; it is ordinarily used as varnish by carpenters.

3. The *Babool* tree yields the same gum which is produced by incisions on the tree; it is not considered worth much, and is not used for any particular purpose.

4. The *Kendoo* tree fruit yields a resinous gum; it is used for caulking the small canoes used in Assam. The Dome fisherman colour their nets with it, and thereby render them more durable in wear and tear. It commands no trade, has no marketable price, and is only prepared as required for the above purposes.

5. The *Butea frondosa* yields a fine red juice from natural fissures made in the bark, which on exposure hardens into a brittle resinous gum; it is used in dying cloths, but its market value cannot be ascertained with any degree of accuracy.

6. A resinous gum resembling Gum Arabic can be obtained from the *Banri* tree, by the bark being incised. The fruit is used medicinally, and the bark and fruit are useful for tanning purposes.

7. A dark coloured dye is obtained from the bark of the *Kalajam* or blackberry.

8. A resinous glue or gum is obtained from the stone of the fruit of the Tetlee tree or Indian Tamarind, but it has no particular value.

9. By making transverse incisions in the larger roots of the *Bir* tree, a white-creamy fluid is obtained of the consistence and quality of caoutchouc. When properly attended to and purified, this gum commands as much as 7 Rupees a maund in the bazar.

10. The pores of the *Agur* or Aloe-wood tree are filled with a soft, pleasant

smelling resin. The resinous wood sells for 4 annas a seer in the bazar, and is much valued for its fragrant properties.

11. A gum is obtained from the juice and resinous balsam of the *Bhellah* tree; it is of a black colour and acid in taste, and is usually used by the natives to mark their cotton clothes.

12. *Nowgong.*—The Deputy Commissioner reports that he cannot find that there are any resinous products in his district.

13. *Seebsaugor.*—The Deputy Commissioner reports that there are several kinds of resinous exudations yielded by trees in Assam, the most important being the product of the Indian rubber tree. The absence of conifers in the plains reduces the number of trees producing gummy. [illegible] to but few. These gums are occasionally used by the Nagas for illuminati[illegible]e trees are too scattered and the localities inaccessible to render the methodical collection of gums commercially profitable. There may be, however, resin-bearing trees in Assam, of which residents in the province are unacquainted. These, should they exist, will probably not be discovered unless searched for by some gentleman possessed of sufficient acquaintance with the principles of economic botany.

14. *Luckimpore.*—The Deputy Commissioner reports that the only resinous products procurable in his district are the *Dhoona* or common resin, and the *Lac*; 200 maunds of the former and 20 of the latter being annually collected.

15. *Cossyah* and *Jynteah Hills.*—The Deputy Commissioner regrets his inability to report on the subject at present, but states that he will endeavour to obtain such information as is necessary and submit a report hereafter.

16. *Durrung.*—The Deputy Commissioner has again been called on to furnish the required information, which, when received, will be submitted in continuation of this report.

Commissioner of the Presidency Division, No. 90Ct., dated 27th February 1867.

Reports that the only resinous products of the Nuddea District, are the *lac*, which is obtained from the *Ussutha* or *Peepul* (Ficus religiosa,) and the *Koochla* (Nux Vomica), both of which are of inferior description and are found in small quantities in jungle trees. No other gums are produced in the other districts of his Division.

Commissioner of Cooch Behar, No. 238, dated 9th May 1867.

Reports that in his Division there are no resinous products forming article of trade worth mentioning. The resin of the sal tree was collected to a very small extent, but as the tree is destroyed by the process, and the forests having been placed under a Conservator, this will probably cease. The pines of Darjeeling on the borders of the Garrow and Cossyah Hills yield tar in small quantities, but the trees are not sufficiently abundant to admit of their produce becoming an article of trade. Stick lac is also collected in small quantities, and the caoutchouc is likewise reported to be procurable, but the trade in this latter article has not even commenced.

COMMUNICATIONS OF MISCELLANEOUS SUBJECTS.

The following letters were read :—

1.—From Dr. Brown, Secretary, Agricultural and Horticultural Society, Lahore, in reference to the monthly exhibition of rare plants now introduced by this Society. Stating they would wish to follow the example, and enquiring if the Society would place two of their silver medals, at prime cost, at the disposal of the Punjaub Society to be similarly awarded. Agreed to, on the recommendation of the Council.

2.—From Dr. George Henderson, and Mr. H. Cope, from Umritsur, suggesting a reference to Government in respect to the present heavy charge for seeds by Dâk-banghy ; the following is extract of Dr. Henderson's letter —

"I am glad to see that the Sample Post Rules have been extended to the Colonies, this will enable us to get seeds at a very trifling cost, from all parts of the world, and with such greater certainty of their germinating, than if sent by any other means of conveyance.

It is rather anomalous, however, that to send a packet of seeds, weighing one pound, from Umritsur to Calcutta, costs Rs. 3 if not Rs. 3-14, whereas by Sample Post I can send the same packet to London for 12 annas, or to Australia for 8 annas, so that the cheapest way of sending small sample packets from the Punjaub to Calcutta is to send them *viâ* Australia, having them re-posted there for Calcutta. As the Society is very much interested in this subject, I propose that they should represent the matter to the Postal Authorities. At present the cost of carriage of a small packet of seeds from Calcutta to the Punjab is more than the actual value of the seeds in London.

Agreed, that a communication on this subject be made to the Director General of Post Offices.

3.—From John Capper, Esq., Secretary, Irrigation Committee, Colombo, requesting information in respect to trials of Carolina Paddy in Bengal, as a guide to experiments in Ceylon.

The Secretary intimated that he had replied fully to Mr. Capper, giving him all the information in his power.

4.—From T. Bayley, Esq., Cape of Good Hope, in respect to Cereals.—"I hope"—writes Mr. Bayley,—"some Mooltan wheat is coming as well as soft Egyptian, as the Farmers here seem to like it best. I have lately procured some Egyptian wheat *direct from Egypt*, but I am afraid it is not the same as that you sent me from the N. W. Provinces.

Pray get some *Mooltan Seed Wheat* for us, if you can get no oats, and a little "soft white Egyptian."

"Did any one try the wheats we sent to your Agricultural Society from the Cape, and what have been the results ?"

The Secretary mentioned that these wheats had, unfortunately, reached too late for last season's sowings, and the Weevil had since rendered them unserviceable.

4.—From Secretary, Board of Agency, E. I. Railway, applying for the aid of the Society in obtaining a large collection of vegetable and flower seeds for the use of the Railway employés.

The Secretary intimated that, with the consent of the Council, he had lost no time in taking steps to meet this requisition.

5.—From Secretary, Orissa Famine and Orphan Relief Fund, requesting the assistance of the Society in procuring [illegible]ge supply of native vegetable seeds for the Special Commissioner in Orissa. This request has been fully met.

6.—From the Secretary, Mysore Agricultural Association, Bangalore, forwarding a prospectus of the new formed Agricultural Association for the Province of Mysore, and requesting co-operation in the way of seeds, &c.—Complied with.

7.—From Dr. Forbes Watson, India Museum, London, enclosing Bill of Lading and Invoice for a consignment of about 30 maunds of Carolina Paddy per *J. P. Whitney*, from Boston. Agreed that the names of applicants be registered for the Paddy at cost price.

For the above communications and presentations the best thanks of the Society were accorded.

Wednesday, the 17th July, 1867

A Grote, Esq *President, in the Chair*

The Proceedings of the last Meeting were read and confirmed

The Gentlemen proposed at the last Meeting were elected Members, *viz* —

Major W R E Alexander, Messrs J D Gash, Walter Williams, S Wright, W J Law, H J Place, and Coomar Greeschunder Sing

The names of the following Gentlemen, were submitted as candidates for election —

Frederick Wilcox, Esq , Bengal Police, Pooroolia,—proposed by Mr E V. Westmacott, seconded by the Secretary

J C Hamilton, Esq , Indigo Planter Hattie Oostee, Tirhoot,—proposed by Mr. S P Griffiths, seconded by Mr M Henderson

Capt F J Alexander, Invalid Establishment, Mussoorie,—proposed by Capt H O Currie, seconded by the Secretary

W H Clarke Bell Esq , Indigo Planter, Coxially, Nuddea,—proposed by Mr Griffiths, seconded by Mr A S Sawers

Mr Dhunjeebhoy Byramjee Mettha, Merchant, Calcutta,—proposed by Mr. Joseph Agabeg, seconded by the Secretary

H F Brown, Esq , Merchant, Calcutta —proposed by Mr Griffiths, seconded by Mr Henderson

J J Guise, Esq , Merchant, Calcutta —proposed by Mr Griffiths, seconded by Mr. Henderson

H Bell, Esq , c s , Nuddea —proposed by Capt H T Forbes, seconded by the Secretary

W H Hinde, Esq , Calcutta,—proposed by Mr H Krauss, seconded by Mr G R Ruxton

Dr W R Grylls, Civil Surgeon, Chindwarrah, proposed by Colonel J. Ashburner, seconded by the Secretary

F G Eldridge, Esq , Merchant, Calcutta,—proposed by Mr S P Griffiths, seconded by Mr M H Griffith

Dr Kenneth McLeod, Civil Surgeon, Jessore,—proposed by Mr H B Lawford, seconded by the Secretary

E Stewart, Esq , Deputy Magistrate, Mudhypoora, Bhaugulpore,—proposed by Dr W H Hayes, seconded by the Secretary

The following Contributions were announced —

1 —Report of the Committee of the Bengal Chamber of Commerce from November 1866 to April 1867,—from the Chamber

2 —Annals of Indian Administration, Part IV, vol X —from Government of Bengal

3.—Memoirs of the Geological Survey of India vol VI part 1,—from the Superintendent

4.—Journal of the Asiatic Society of Bengal, Part I, No. IV 1866,—from the Society

5.—Ten samples of Wheat from the District of Hoosunghabad,—from the Chief Commissioner, Central Provinces

6.—A small collection of acclimatized Flower seeds from the garden of the Agricultural and Horticultural Society, Lahore,—from the Secretary.

7.—A few kinds of acclimatized Flower seeds,—from Mr G Bartlett.

8.—Seeds of *Clianthus Dampieri*,—from Mr H J Butler.

9.—Four *Araucaria* plants of sorts,—from Mr J M Herrold

10.—A fine large plant of Perennial Phlox,—from Mr W Ter Veen

The Gardener announces that he has for distribution a good supply of plants of *Erythrina Blakei*, *Colvillea racemosa*, and *Poinciana regia*, as also *Aristolochias* of sorts

FLORAL EXHIBITION

The Secretary read the following list of plants sent in for examination —

From Mr Arthur Mowbray's garden — A fine plant of *Cypripedium (purpuratum?)*

From Mr H Krauss garden —A plant in fine flower, of *Dendrobium formosum*

From Mr Grote's garden —Plants of *Sarcanthus* species, *Saccolabium* species, and *Lourea vespertilionis*

From Mr S Jennings garden — A plant of *Epistylium* species, raised from seed from Australia

From the Rajah Suttchurn Ghosal's garden —Several pots of *Caladia*, *Achimenes*, and a fine *Bromel*

From the Royal Botanic Garden —A collection, in fine order, of 12 Ferns of sorts, 6 plants of *Caladia* two Arums, namely, *Anthurium cordifolium* and *A. leuconeuron*, *Alocasia* [illegible] and *A marmorata*, *Begonia* species from Punkabaree and *B rubrinervia*

From the Society's garden —Ten *Caladia* of kinds in fine order, 4 plants of *Achimenes* and 2 of *Gloxinias*, 9 Ferns of sorts, four plants of *Anaectochilus* species, and a few other plants

Messrs. W Stalkartt and J Scott, as Jurors, reported the award,—

To Mr Mowbray—of 6 marks for his new *Cypripedium*

To Mr Krauss,—5 marks for his well flowered *Dendrobium formosum*

To Mr Jennings—4 marks for his *Epistylium*

And to the Rajah Suttchurn Ghosal,—3 marks for his *Caladium argyrites*

Notes and Queries.

Read the following notes on the Arabian Date Palm *(Phœnix dactylifera)* in reference to the Query of Mr. R. D. Stewart submitted at the last Meeting;—

From Mr. A. T. T. Peterson.—"In 1850 I made a seed bed of seeds of the Arabian date. They all vegetated freely. I planted out at least 20 trees in good positions; they grew well for about 3 or four years but gradually died off; the last died in 1856 after giving birth to an unfructuous spathe. This experiment was made at Neelgunge, four miles east of Barrackpore."

From Mr. F. L. Beaufort.—"You referred at the last Meeting of the Society to Mr. Edgeworth's experiments made at Mooltan in 1851-52, on the juice of the Arabian date tree. I have some knowledge of the result of his experiments, because I sent to him 4 men from Jessore to assist him,—men whose occupation had been to tap the date tree of Bengal, and to convert it into sugar. They staid with him for a considerable period, but they found that the juice of the tree could not be extracted as it is here. It would not run, and what little was obtained was so viscid,—so like bird lime was his expression, as I remember,—that it was entirely useless for the purpose of making sugar. Here, you know, it is as liquid as milk; but both Mr. Edgeworth wrote to me, and the Jessore men on their return told me, that it was impossible to make sugar from the Date tree at Mooltan.

"Mr. Edgeworth spoke of the tree as the Arabian or Persian Date, and I apprehend that it differs considerably from the Bengal Date. I recollect one peculiarity, *viz.*, that at Mooltan, some of the trees had more than one stem, which is, never as far as I know, the case here.

"But I write entirely from memory. If you think it worth while to do so, and will write to Mr. Edgeworth at Annerley, near Sydenham, he will doubtless be happy to give you more full information."

From Mr John Scott of the Royal Botanic Garden —

"The Arabian Date palm has been cultivated for many years here, but never, so far as I can hear, produced fruit. With the exception of one plant about 10 feet high,—and which I am told was introduced by Dr. Wallich—all the other plants here of the Arabian Date, are small but remarkably healthy."

From Dr. E. B. Brown,. Secretary, Agricultural and Horticultural Society, Lahore. "I am not able to give you much information about the growth of the Arabian Date, but about the Anarkullee Post Office, and at Shahdera, there are a number of date trees, which afford edible fruit, and which I have considered to be the *Phœnix dactylifera.* They are said to have been accidently sown by the soldiers in Runjeet Sing's army, while encamped in these places."

From Mr. H. G. French.—"With reference to the Arabian Date; many years since the late Mr. Gilson Rowe sowed some seeds of it in his garden at Churnaraindhee Factory, in the Meergunge Concern, Jessore, they vegetated well, and grew up more vigorously than the Bengalee Date, into strong plants of 3 to 4 feet in height, the leaf also appeared broader, after that time I lost sight of the plants

"I never knew the Bengal Date tree to have but one head. I have counted from 60 to 70 yearly cuttings on Date trees in the Jessore and Furreedpore Districts which, with the 7 years growth before they yield juice sufficiently to admit of their being tapped, would make the term of their existence from about 75 to 80 years

"On the factory ground of Hobrah in the same Indigo Concern, there was a country date tree which was not tapped until it was 10 to 12 feet high, or, say, 12 to 15 years of age its fruit previous thereto was larger, more pulpy and sweeter than of that purchasable in all native bazaars, but not so sweet as, nor equal in flavor to, the fruit brought from Arabia '

Mr Peterson submits the following three queries —

"1 —The natives have a saying that if you once cut or prune a Mango tree it never bears fruit In 1849, I pruned a number of *Culum* trees planted by Mr Wm Thompson in 1844 not one of which has given fruit Other trees planted by that gentleman, which were not pruned, have borne fruit

"2 The natives say that if a Jack tree is ever removed from the spot where the seed was sown, that the tree either never gives fruit, or if it gives fruit, that it is not fit to eat Has any one tried the experiment ?

"3 The Bâg Borinda, a common fence in Bengal, has a nut which, taken in small quantities, is agreeable to the taste and makes a very agreeable purgative Is the Bâg Borinda the same as the *Croton Tiglium* ? [The Bâg Borinda is another plant, *Jatropha Curcas*]

Mr French observes as follows in respect to the third query of Mr Perterson —

"With reference to the Bagh Bherenda, not it, but the Jamalgota is the *Croton Tiglium* From the juice of the Bagh Bherenda, beaten up into a froth and that froth dried in the sun and pressed, the natives make an excellent tooth powder, which, they say, cures toothache, and makes the gums healthy and firm after mercurial exhibits"

Mr A Eliott Russell puts the following query —

"Is there any way of protecting the roots of roses from a coleopterous grub which I find very destructive here, and apparently belonging to a tribe of the Cockchafer family ? And is there any mode by which the leaves of the roses can be made distasteful to the small insect that eats them up during the night time ?

"If any one can give any information on this point, it will be very acceptable to me, and doubtless to others who have suffered as I have done lately"

Read the following Minutes by the Members of the Committee on the sample of Cotton placed on the table at the last Meeting, raised in Mr Grote's Garden from seed "Hybrid between Sea Island and Bourbon," received from England from Major Trevor Clarke, some 18 months ago —

Mr T H Mosley reports —"A fine silky Cotton of good staple and fair strength of fibre, color indifferent, and proportion of seed to wool universally large, but, on the whole, a favorable specimen of Hybrid cultivation"

Mr Andrew Stirling remarks —"A fine-stapled silky Cotton of fair strength, rather liable to injury in cleaning. I am but little acquainted with Hybrid Cotton of this class, and cannot form any opinion as to how it stands compared with them."

Mr M Henderson observes —"A fine silky long stapled Cotton, possessing both strength and softness: the color is rather objectionable, I think, in Cotton of this quality, and it may be difficult to clean it properly."

Read the following communication from Lieutenant J F Pogson of Simla, suggesting the introduction of *Chenopodium Quinoa* into the Himalayas and the high lands of Thibet —

"The developement and extension of British trade with Central Asia, having now been fairly taken in hand by the State, it becomes the duty of all those who wish it success, to suggest practical measures having for their object the introduction of a new and suitable description of food, into regions where neither Wheat or Barley will grow.

"Inland trade, as carried on by caravans to be successful, demands a cheap and ample supply of wholesome and nourishing food.

"A kafila of ten thousand men would under present circumstances, die of starvation between Leh and Yarkund, unless they took a sufficient supply of food with them: consequently, every camel load of wheat (weight 6 maunds) the highest value of which is Rs 30 would cause six maunds of merchandise, of say, one hundred times its value, to be excluded from the carravan, for want of carriage. If, however, food in abundance was available *en route*, the Russian carravans from Yarkund, and the Indian carravan from Cashmere, would travel to and fro without having to carry a month's provisions with them. In order to bring about this most desirable and important result, two things are necessary. The first is the liberal support of the Government of India, and the second, the active co-operation of the Agricultural and Horticultural Society of India, importing and introducing the seed of 'Chenopodium Quinoa,' into the Himalayas, and the high lands or table lands of Thibet.

"This most valuable plant, and food producer, is described as follows in Professor Johnstone's Chemistry of Common Life* —'Quinoa, a variety of grain scarcely known in this country, is the Quinoa, a small roundish seed which is extensively cultivated, and consumed on the high table lands of Chili and Peru. There are two varieties of it—the sweet and the bitter, and both grow at elevations rising to 13,000 feet above the level of the sea, where both Rye and Barley refuse to ripen. It is still the principal food of many thousands of people who occupy those high table lands, and, before the introduction of European grains by the Spaniards, is said to have formed the chief nourishment of the Peruvian nation It is very nutritious, and in its composition approaches very nearly to that of Oatmeal Thus the flour or meal of the Oat, (for the sake of comparison I have added the components of the best English wheat flour) and of the Quinoa consists respectively of—

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* See page 104 105, vol I

	Oat-Meal	*Quinoa Flour (Voelcker).*	*Wheat Flour*
Water	14	16	16
Gluten	18	19	10
Fat	6	5	2
Starch, &c	62	60	72
	100	100	100

"'A grain so nutritious as this, is a very precious gift to the inhabitants of the elevated regions of the Andes Without it these lofty plains, could only be *runs for cattle, like the summer pastures among the valleys of the Alps*'

"On referring to my note book, I find that the line of perpetual congelation or snow line, on the southern slope of the Himalayas is 13,000 feet above the level of the sea, whilst the snow line on the northern slope, is 16,630 feet above the sea level, consequently, on the introduction of the Quinoa, the Thibetian plateaus up to 13 000 feet, might be sown with this valuable grain, and on the southern slope, on all lands where Barley refuses to ripen, the Quinoa would yield a most productive harvest

"It is simple nonsense to imagine that the Thibetian, Ladakee, and Paharee, will object to cultivate a grain, which will ripen where Barley will not, from sheer prejudice But supposing such prejudice manifested itself on the introduction of the seed, it might be at once overcome by offering a premium payable at Leh, at the Moravian Missionary stations at Lahoul, at Sooltanpore and Rampore, for each ten-maund sample of Quinoa grown on the Thibet side of the Himalayas, and similar rewards should be given for the grain (Quinoa) grown on the Hills between Almorah and Murree, and Murree and Hazara These rewards might be paid at the nearest Tehseeldaree The seed, after inspection by an European Officer, might, in due course, be distributed gratis, to all comers for future sowings. Under judicious management, it is more than probable that in three years after payment of the first premium, that the inhabitants of the southern Himalayas would, as heretofore, grow Wheat and Barley for sale and consumption, and increase their annual income by cultivating the Quinoa on lands which are at present incapable of producing any grain in crops whatever. To the Thibetian, and Trans-Himalayan races, the Quinoa would be a boon of incalculable value.

"In the event of this measure meeting with the approbation of the Agricultural and Horticultural Society, I would suggest that the Quinoa seed be imported in the husk, just as gathered, and without undergoing threshing or any other preparation. The seed to be packed in a tin case, in the centre of which a perforated tin cylinder 3 inches in diameter and 12 inches in height, should be firmly soldered. Three inches of the upper part of the cylinder should remain intact, the remaining nine inches being perforated. Each perforation to be 1/12th of an inch in diameter, and ⅓rd of an inch distant from its neighbour.* The cylinder to be provided with a cap or cover. The cylinder, after being soldered in its place, is to be ¾th filled with bits of very coarsely pounded charcoal, from the size of a pea and below the size of a marble. The cover is then to be put on. The box being now ready, the unhusked Quinoa seed is to be put into it gradually and gently pressed down. The operation being repeated till the box is filled, when it should be soldered down, packed in wood, and shipped without delay direct to India.

"The object of placing the tin cylinder, charged with charcoal † has to be explained. Any moisture existing in the seed, husks, or seed stalks, when given off, would at once pass this, the perforations of the cylinder, and be absorbed by the charcoal. The upper portion of the cylinder being empty and closed, would always contain in a condensed or compressed state, any vapour produced by heat during the voyage, and the seeds being kept cool and dry in the husk, would reach in a perfect state of preservation, care should be taken that the box of wood within which the tin case is placed, is well and strongly made. For convenience in transit, in India, each tin case should be of the following size, viz., length 3 feet, width 15 inches, depth 12½ inches This, when placed in the packing case, would give a convenient sized box or package, two of which could be easily carried by a mule.

"Finally, it would be advisable to obtain, through the British Consuls, every possible information regarding the culture of the Quinoa, (including produce per acre) both in Chili and Peru. To import the bitter variety, unless it is fit for food, would, I think, be unnecessary"

Resolved—That the best thanks of the Society be given to Lieut. Pogson for his interesting paper, and that he be recommended to communicate also on the subject with the Government of the Punjaub. Further, that a reference be made to Dr. Forbes Watson of the India Museum, with the view of obtaining a supply of the seed in question.

COMMUNICATIONS ON MISCELLANEOUS SUBJECTS.

1. From Dr. Thomas Anderson, Darjeeling, enclosing a copy of the report by Mr. Howard on specimens of Cinchona Bark sent from Darjeeling for analysis,

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† In the centre of the tin case.

* Each square inch would contain 12 perforations 1/12th of an inch in diameter.

and offering to give the entire correspondence on this subject for publication in the Journal Dr Anderson's offer was accepted with thanks

2 —From Dr A C Maingay, Malacca, to the President offering a few remarks regarding the Malacca Sago Palm —"I send a few seeds of *Metroxylon Sagu* (Rott) the Malacca Sago Palm It grows in marshes but prefers the inundated banks of small streams, and would, I think, thrive in the Sunderbunds or some parts of Assam Each tree yields about Rs 60 worth of Sago, and as this is dependent upon its not being allowed to run to seed the procuring of the latter in a ripe state is extremely difficult The tree itself when once it has firmly taken root is propagated by off shoots from the base of the parent stem, so that in time it forms a large clump I am promised a further supply of seeds, but I have waited two years before procuring those I now send

3 —From Dr Geo Bedie Secretary Agricultural and Horticultural Society of Madras in reply to a requisition for a larger supply of acclimatized Carolina Paddy — I duly got your note writes Dr Bedie, and very much regret that not an ounce of Carolina Paddy is now available in the local market I did my best, early in the year, to collect all I could and sent you quite three fourths of all that came to hand You will thus understand the great demand that has existed for it and it is still on the increase Hardly a day passes but I get applications for it, from all parts of India and even Ceylon

4 —From Mr Kurz of the Royal Botanic Garden Calcutta to the President, in respect to a variety of plantain raised in his (Mr Grote's) garden —

"The fine plantain you sent me appears to be a variety of *M Sapientum*, and identical with a variety which Mr Teysman brought from Siam to the Botanical Garden in Java, called by the Siamese Tun blooee Mangwa It is one of the most delicate kinds there, and was new to the Indian Archipelago "

5 —From Dr E B Brown, Secretary, Agricultural and Horticultural Society, Lahore, returning thanks for compliance with their request for silver medals, as submitted at our last Meeting —

"Our Society is very much obliged for the kind manner in which our application for medals has been acceded to by your Council We shall not require them till October 1867, as we only intend to give the medal to the gentleman who obtains the most marks during the year "

6 —From Captain Thomas Hutton, Mussoorie, intimating that the Japan silk worms' eggs sent to him in the early part of last year, turned to annuals hatched and died, and that those from China stock, which were sent in the early part of this year, hatched in March, and all died when about three days old

7 —From Captain W Cadell, Commissioner, Hyderabad Assigned Districts Ellichpore, applying for seeds of the China grass —

"The Secretary of State has suggested," writes Captain Cadell, "that a trial of the China grass seed should be made in the Hyderabad Assigned Districts.

I should be much obliged by your letting me know whether you have any of the seed that you could spare, or, if not, whether you could procure any

The Secretary mentioned that as the plant in question is not propagated by seed, and as the stock in the Society's garden, owing to constant demands, had become very limited, he had recommended to Captain Cadell to apply to the Madras Agricultural and Horticultural Society, to whom plants had been sent last year by this Society

8 —From Mr Joseph Agabeg, forwarding flowers of the Ansenna tree *(Pterocarpus Dalbergioides)*, descanting on the fragrance of the flower and the beauty of the tree, and suggesting its general introduction along lines of public thoroughfares and for avenues as affording a much finer shade than many other trees, which are generally selected for this purpose

9 —From Dr Thomas Anderson, Darjeeling, 2nd July intimating his intention, in reference to a requisition made some time ago of submitting a full report of the arrangement of the Royal Botanic Garden at an early date, as soon as his return to Calcutta will enable him to draw up the *précis* from the records in his office

Mr S H Robinson observed that the motion of which notice was given by him at the Meeting in January last, referred to Dr Anderson's scheme for planting out the Botanical Garden which had been approved by Government, and not to the full report alluded to in the above letter and he therefore begged to move again that Dr Anderson be requested to favor the Society with a copy of the scheme in question —Agreed to

10 —From Messrs D Landreth and Son, of Philadelphia, forwarding Bill of Lading and Invoice of Vegetable seeds per *Michael Angelo via* Liverpool

11 —From Messrs Law, Somner & Co, of Melbourne Invoice and Bill of Lading of Field seeds per *Medusa*

For the above communications and presentations the best thanks of the Society were accorded

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Wednesday, the 21*st August*, 1867

A Grote, Esq, *President in the Chair*

The Proceedings of the last Meeting were read and confirmed

The Gentlemen proposed at the last Meeting were elected Members, *viz* —

Messrs Frederick Wilcox, J C Hamilton W H Clarke Bell, Dhunjeebhoy Byramjee Mettha, H F Brown, J J Guise, H Bell, C S, W H Hinde, F G Eldridge, E Stewart, Capt F J Alexander, Dr W R Grylls, and Dr Kenneth McLeod

The names of the following Gentlemen were submitted as candidates for election —

C Ducas, Esq, C E, Burrakur,—proposed by Mr E V Westmacott, seconded by the Secretary

J O Logan Esq, Indigo Planter, Midnapore,—proposed by Mr J H Johnstone seconded by Mr T H H Shortt

Joseph Sliden, Esq, C S, Superintendent of the Dehra Dhoon,—proposed by Mr R J Richardson seconded by the Secretary

Lieutenant A M Showell, Commissariat Department, Nusseerabad,—proposed by the Secretary seconded by Mr S H Robinson

W F Kruger, Esq E I Railway, Calcutta,—proposed by Mr R Vesey Stoney, seconded by Mr S Jennings

Colonel Charles Prior Commanding at Dhurmsala —proposed by the Secretary, seconded by Mr Grote

Allen Stokes Esq, E I Railway, Jumalpore,—proposed by Mr W Stalkartt, seconded by Mr Grote

Dr Booth, [illegible] —proposed by Mr Stalkartt seconded by Mr Grote

R J Clarke Esq Executive Engineer Nowgong —proposed by Major W R E Alexander seconded by the Secretary

F Bond, Esq, Executive Engineer Cuttack —proposed by Mr W Wright, seconded by Dr T O Woodford

R Pyne, Esq, Purneah —proposed by Mr H M Harrold, seconded by the Secretary

The Hon'ble J B Phear —proposed by Mr Grote, seconded by the Hon'ble J C Norman

G B Pasley Esq, C S, Ghazeepore,—proposed by Mr Thomas Wilson, seconded by the Secretary

W Keates Esq, Deputy Inspector General of Hospitals, Dacca,—proposed by Major W N Lees seconded by Mr Grote

Mahomed Ameer Hossain Khan, Rajah of Mahmoodabad, Seetapore District, Oude,—proposed by Dr Bonavia seconded by the Secretary

Wilton Oldham, Esq, LL D, C S, Ghazeepore,—proposed by the Secretary, seconded by Mr Jennings

Secretary, Local Committee, Chindwarrah,—proposed by Mr J M Berrill, seconded by the Secretary

Geo Woodbridge, Esq, Chief Resident Engineer, Eastern Bengal Railway,—proposed by Mr Jennings, seconded by Mr J B Nelson

Major W C MacDougall, Deputy Superintendent of Studs, N W P, Hauper,—proposed by Mr J A Crawford, seconded by the Secretary

R L Martin, Esq, Inspector of Schools, Midnapore,—proposed by Mr. T H Shortt, seconded by Mr J H Johnstone

R A D'O Bignell, Esq, Assistant Superintendent of Police, Bhuddruck,—proposed by Mr Shortt, seconded by Mr Johnstone

General W F Nuthall, Commanding Eastern Frontier District,—proposed by Mr Jennings, seconded by the Secretary

Secretary, Local Committee, Jhansi,—proposed by the Secretary, seconded by Mr Jennings

Wm Rollinson, Esq, District Engineer, Delhi Railway, Jullundur,—proposed by the Secretary, seconded by Mr Grote

Sherlock Hare, Esq Laojohn Factory, near Seebsaugor,—proposed by Mr Jennings seconded by the Secretary

Robert Stewart, Esq, Merchant, Calcutta—proposed by Mr H Sandeman, seconded by Mr Grote

The following contributions were announced —

1—Report of Bombay Chamber of Commerce for 1865 66—from the Chamber

2—The Annals of Indian Administration, Parts 1 & 2, Vol XI,—from the Government of Bengal

3—Journal of the Asiatic Society of Bengal, Part I No 1 and Part II, No 1, for 1867,—from the Society

4—Progress Report of Forest Administration in British Burmah, 1865 66,—from the Government of Bengal

5—A Wardian case of Plants from Honolulu—from Dr Hillebrand

The Gardener reports that with the exception of a few plants, this collection arrived in a dying and dead condition The few living consists of one *Eugenia* species, two *Colocasia* (2 kinds) one *Musa* species five *Crinum*, of 3 kinds, and one plaint, (name unknown)

6—Four plants of *Araucaria Cookii*—from Mr H J Putler

7—Three plants of a fine white herbaceous phlox—from Mr W Ter Veen

8—A fine large collection of Chrysanthemums from England—from Mr G Livesay

9—A small assortment of acclimatized flower seeds from Lucknow,—from Mr Hodges

10—Seed of *Cassia florida*, from the Secretary of the A and H Society of Bangalore

11—A small quantity of Bamboo seed from Chittagong, from Mr R Macalpine

The following is extract of Mr Macalpine's letter —

"My attention was called to the flowering and seeding of the Bamboo from reading some articles on the subject which appeared in your Journal some time ago, and I am happy to say that I have had an opportunity of gathering some of the seed, and which I have much pleasure in forwarding to your address by the Steamer leaving for Calcutta to day You will observe that it bears a very close resemblance to Paddy, it grows on the small branches of the Bamboo in regular clusters at each joint,—each cluster being composed of from 10 to 20 seeds I have planted some of it here and it has germinated freely The seed sent you is from a Bamboo called by the natives, 'Kulyai,' it grows to a good size but is not much used by them for building purposes, as it is of rather a soft nature and consequently soon destroyed by Insects. Other Bamboos seed in exactly the same way as this one. One called "Doolie," I have seen in seed, but am sorry to say, that I can send you none of it. The village or "Barreewallah Bangh" also seeds in the same way from all I can learn from the natives; and I have had information of its having seeded in some places this season, and will endeavour to obtain some of it for you. The only exception to this mode of seeding appears to be the "Tullah Bansh," some seeds of which were presented to the Society by Mr. Minto in 1865, I believe; still I cannot coincide with that gentleman's version of how it grows. I have made every enquiry of the natives, and I find that one and all agree in saying that the large almond-like seed in question grows from the roots of the Bamboo, and not from the branches of the seed as the seed now sent you, does. I will, however, lose no opportunity getting what information I can on the subject, and informing the Society of it."

12.—Five plants of a *Melaleuca* from Malacca,—from Mr. Grote.

The following is extract of a letter form Dr. Maingay, Civil Surgeon at Malacca, to Mr. Grote's address regarding these plants —

"I have also sent in an old wine case more than a dozen growing plants of *Melaleuça minor*, Smith. I say *minor* because though Cumingiana is specially noted as a Malacca species, I have never been able to meet with any form agreeing with Tarezarniow's description as quoted by Miquel, and I doubt very much if it is any thing but a variety of Minor. Six of these young trees are intended for you and I consider them of considerable importance for the following reason:—They form the first growth in low lying marshes after the heavy forest has been removed, and as these marshes, which extend for hundreds of acres, near Malacca, are by no means so malarious as might be expected, I ascribe it entirely to the Melaleuca growth, for the trees abounding in resin in their leaves act upon the malarious emanations in a similar manner to the Stone Pine of the Landes upon similar emanations in that district, and to a great extent render them inocuous. Upon bruising the Melaleuca leaves you at once perceive the agreeable aromatic odour. I think, therefore, that this quality would render them valuable as an addition to the list of trees useful for planting in marshy, pestilential spots near our Indian Cantonments and elsewhere, provided the Indian cold weather is not found too severe for them. The wood itself is highly durable under water, and the bark, mixed with dammer, &c., is extensively used by the natives to caulk their boats, and might be used for making coarse paper similar to that made from the mulberry bark in Japan."

13.—A small quantity of seed of the "Osage Orange" admirably adapted for hedge fences,—from Messrs. Law, Somner & Co., of Melbourne.

The following are directions from Messrs. L. S. & Co., for the management of the seed:—

"The length of time required for the germination of this seed, when sown in the open ground, renders the operation of weeding a troublesome and expensive process, that gives considerable importance to any artificial method which facilitates the first stage of growth.

Seeds of all sorts which are slow to germinate permit the weeds to make their appearance first, thus rendering the labor of frequent weeding necessary to the protection of the young crop; and to obviate this trouble, where possible, by good management, is a matter of some moment to the farmer and gardener; and in the case of the Osage Orange, which requires months before the germ bursts its covering—thus entailing the usual care of cleaning the bed of weeds before it makes its appearance above ground—any method by which the first growth can be stimulated, so as to save time and labor, will be appreciated by our friends.

We have tried various methods to overcome this difficulty, but none has proved more efficacious than the following, which is simple, easy, and practicable in every place :—

1st.—Early in August immerse the seed in tepid water for two days.

2nd.—After which mix the seed in four or five times its bulk in fine sand, of sand and wood-ashes mixed.

3rd.—Spread the mixture on some sacking or calico (if on a large scale), two to four inches thick, covered, for the purpose of effectually excluding the light.

4th.—Turn it over not less than once every twenty-four hours, to prevent fermentation, and to keep the whole equally moist.

5th.—When necessary, water gently the cloth which covers the seed, but care must be taken not to saturate the seed, or it might rot

6th.—By careful observation, the first germs which issue from the seed will be easily detected—when it is time to sow in the bed, or in drills. In about three weeks after sowing the seed, leaves will make their first appearance."

14.—Five hundred weight of Carolina Paddy acclimatized at Java,—from the Government of Netherland India.

The Secretary mentioned that the report from the Gardener on this seed being very favorable, 90 per cent. having germinated, he had lost no time in distributing it to those whose names had been previously registered, as the season for sowing was fast passing away.

15.—A quantity of acclimatized Egyptian and New Orleans Cotton seed and some seed from the Hinghunghat Pergunnah of the Wurda District, which grows the best indigenous Cotton in India; also some Tobacco seed from the James River, Virginia; all received from the Cotton Commissioner for the Central Provinces, and transferred by the Board of Revenue, Lower Provinces.

The Secretary mentioned that this fine supply of Cotton seed had unfortunately reached too late for this season's sowings, but the Tobacco seed could be sown now with advantage.

16.—Three samples of Cotton, raised in British Burmah, from imported Egyptian and acclimatized New Orleans seed,—forwarded for report by the Conservator of Forests, British Burmah. (Referred to the Committee.)

17.—A fine large sample of Rheea stalk and fibre, prepared at Morellgunge,—from the Messrs Morrell

FLORAL EXHIBITION

The Secretary read the following list of plants sent in for examination —

From Mr W Ter Veen's Garden —Fourteen Ferns in splendid condition, a *Cissus discolor*, exceedingly well grown, a fine plant of *Stephanotis floribunda*, and a perennial Phlox with white blossom

From the Health Officer, Dalhousie Square Garden —Four well grown Caladia, six Rose plants, a Phalœnopsis, *Achimenes* (Sir Treherne Thomas) and a few other plants

From Rajah Suttoshurn Ghosal's Garden —Ten Ferns of sorts, and six Caladia of sorts

From Mr Grote's Garden —Plants of *Polychilos Cornu cervi*, *Ceropegia Gardneri*, *Munronia Javanica* and *Eranthemum B[illegible]*

From Mr S Jennings Garden —A plant of *Dendrobium Jenningsii*

From Mr H Krauss' Garden —A plant of *Aerides quinquevulnera* (?) and one of *Phaseolus Caracalla*

From the Hon'ble Mr Phear's Garden —A plant of *Arundina sinensis*

Messrs John Lynam and Arthur Mowbray, as Jurors, reported the award —

To Mr Ter Veen —Two marks for a fine specimen of *Phymatodes* species, two marks for a good example of a *Pteris* one mark for *Pteris serrulata*, and four marks for an exceedingly well grown *Cissus discolor*

To the Health Officer —Three marks for a well grown plant of *Phalœnopsis grandiflora*

To Mr Grote —Six marks for his *Ceropegia Gardneri*, three marks for *Polychilos Cornu cervi*, and two marks for *Munronia Javanica*

To Mr Jennings —Eight marks for his *Dendrobium Jenningsii* exhibited for the first time

To Mr Krauss —Ten marks for his *Aerides* (*quinquevulnera* ?)

NOTES AND QUERIES

The Secretary submitted the following notes and queries from Mr C Horne of Mynpoorie —

Query 1 —"Every horticulturist in India is not an Entomologist and yet all m[illegible]ave noticed the manner in which the leaves of liliaceous plants are devoured [illegible]ternally and externally by caterpillars, especially at the beginning of the rains

I ask, I fear, in vain, is any wash known which, poured into the crown of the plant, whence they generally emerge, or washed over the leaves to render them unpalatable, whereby this plague may be stayed? I have tried a strong decoction of tobacco, ashes, the juice of the "hur-hur" plant, &c

The caterpillars are those of sundry moths some larger and some smaller, and are laid on the outside of the leaf. The grub when hatched cuts in and lives between the inner and outer skin. When fully grown it descends into the ground and becomes a chrysalis, thence to emerge a moth.

I have found as many as 30 or 40 of these chrysalisis within a few inches of soil at the foot of a large lily.

The whole of my plants of the *Gloriosa Superba* lily have this year been destroyed by them, although the plants were inspected thrice daily.

Query 2.—"Can any of your Members tell me anything about the juice or sap of the *Neem* tree? *Melia Azadirachta.*

I had for many years heard from the natives of the fame of this juice as an anti-scorbutic, and a medicine of great general virtue. When a tree takes to bleeding, a *fakeer* generally takes possession, sits at the root, and, collecting the juice as it drops, sells it at 3*d*. or 4*d*. per bottle.

Many bottles will flow in one day, and when I tried I found I had collected a quart in about 4 hours. This was in the day; but at night the flow is much greater. This year a tree in my compound began to bleed. There was a small natural fissure in the bark of one of the arms of the tree, about 10 feet from the ground, from which the sap dropped steadily from the 14th January to the 5th March 1867.

I gave away a great deal of it, and drank some myself. When fresh it was milky in appearance,—slightly viscous, and intensely bitter to the taste. The squirrels and insects appeared to like it very much. Some that I put in a bottle and having closely corked it stood on my table, fermented, so that it blew the cork out in 20 hours. Temp. 70° Farh. After this it precipitates and becomes transparent, the deposit resembling white mucilage. I have a bottle now in this condition, which I will gladly send for analysis to any one who will take the trouble. I gave Dr. Prentis a bottle, and he gave it to Dr. Pringle, who I hear sent it to Calcutta for analysis; but I have not heard the result.

I tried to get an analysis but failed; thus:—I sent a bottle duly labelled with the printed ticket and number of the Local Committee to the Great Show at Agra. It was entrusted, with many other articles, to a native official. He took it to Agra, but the Officer appointed to receive articles quietly took it, drew the cork, and, pouring out the contents, returned the bottle saying—"We don't take in such things here!!"

Any information relative to the above will be gladly received. I believe the "bitter cup" is turned from neem wood; whilst Dr. Lazarus of Benares prepares an essence from it. This will indicate that if the juice could be preserved pure, it is a subject worthy of notice."

In reference to the above the Secretary drew attention to a paper by Dr. Cornish, in Vol. IV of "The Indian Annals of Medical Science" in which, under the head of "Indian Febrifuges," he treats at some length on the useful medicinal properties of the bark of the Neem tree, and of the bitter oil obtained from the ripe seed A paper on the therapeutic applications of the same tree from the pen of Dr Waring is also published in the same volume In O Shaugnessy's "Bengal Dispensatory" allusion is made to the gum yielded by the trunk of the tree, and he states that the young trees, *when tapped*, yield a saccharine sap or toddy, capable of undergoing the vinous fermentation The Secretary added he was not previously aware of the Neem tree yielding a juice, as above described by Mr Horne, by spontaneous exudation, nor could he find any allusion to it in the various works he had consulted

Query 3 —Are Geraniums perennial? I find it difficult to get the unscented and common red to live over 2 years

Query 4 —What is the best time for striking cuttings of Verbena (sweet scented) I imagine the close of the cold season?

Query 5 —What aspect is held to be the best for Strawberries? I mean in the North-west I think East?

Note 1 —It is the general practice with arrowroot to dig up the plants, take the tubers for manufacture, preserving some for seed, and then to throw away the stock

This year I re planted the stalks by the edges of my water courses, having cut off the tops They all grew and in spite of a fearfully hot season, I have had not only my reserved roots, but also my plants to plant out

Many of these latter had meanwhile thrown out bulbs

I was thus enabled to plant out double the amount of land I had hoped to do The hint may be of value to others

Note 2 —For two seasons all attempts to rear Strawberries here have failed, although Dr Guise, who was here many years since, tells me he used to have them

The plants, runners and all, although every care is taken as regards soil, drainage and aspect, fogg off, as the rains come on, so that last year out of 68 plants, not counting runners, I only saved 7 small runners

These 7 I planted in large pots with rich soil and good drainage, and gave them more air This was in October and November 1866 In February 1867, I took the 7 pots and planted them (in pots) in the soil half their depth putting 6 pots round each, full of good soil They immediately threw out runners, which were pegged down in the surrounding pots, and, by carryying out this system, I have now about 350 well grown plants for runners, and my extension of them is only limited to the number of pots I can get The rains do not seem to affect them, and I thus hope to have plenty of plants for a good bed '

Reply —In reply to Mr A T T Peterson, allow me to observe that transplanted jack trees bear very well at Mynpoorie, although there is the same native idea prevailing, as mentioned by him to the contrary

Baboo Joylunauth Bose of Chumparun puts the following Query —

"I shall feel much obliged by your laying the following Query before your Committee for an answer —

'How does a certain species of insect manage to get into the mangoes of Eastern Bengal which render the fruits partially unfit to be eaten?'

This is an important question which involves the interest of a large portion of the mangoe-eating population of the country, extending from Furreedpore to Sylhet If a remedy be found, it would be largely availed of by the people of Eastern Bengal"

From Lieut.-Col R P ANDERSON, Commanding, 34th N I., Lucknow —

"There is a "caterpillar" or "grub" that attacks fruit trees and does great damage It forms a "tunnel" in the branches and cannot be got at The fruit suffers as well as the tree This "grub" I have destroyed by merely injecting the juice of "Toolsee" (mixed with water) into the tunnels. The signs are as follows —the bark of the trees has the appearance such as a person suffering from "Leprosy," *i e*, that *cracked* and *rugged* appearance.

The fruit when ripe is very much smaller, marked like the bark, *i. e.*, with ugly scales * As I have heard that Coffee trees in Madras have been much damaged by some "grub," perhaps a report of my success may lead to a trial. The juice of "Sage" also is equally good *mixed* with "Toolsee"

My impression is, that the wood used in "Marine purposes" if impregnated with "Toolsee" or "Sage" juice (under the action of steam) would not be attacked by that "wood worm" which does such harm to ships &c &c."

PROPOSED INTRODUCTION OF CHENOPODIUM QUINOA INTO THE HIMALAYA

Read the following letter from J D. Forsyth Esq, C B, Commissioner and Superintendent, Jullundur Division, on the above subject —

"In the published account of the Proceedings of your Society's Meeting held on the 17th July, I observe a very interesting and important communication from Lieut. J F. Pogson of Simla, suggesting the introduction of *Chenopodium Quinoa* into the Himalayas and the high lands of Thibet.

2. Though I have not the honor of belonging to your Society, I venture to offer a few remarks on this subject, as affecting greatly the interests of the inhabitants of the Provinces of Lahoul and Spiti which are attached to this Division.

3. It is a well known fact that the Lahoulees are unable, owing to the very limited period of their summer, to raise much grain, and frequently their crops are lost by an early fall of snow. They are therefore driven to seek subsistence by trading with other countries and have to import grain from Kooloo.

4 The grain grown in Lahoul and Spiti is of a very inferior kind, and not at all suited to the digestion of persons accustomed to wheat and flour.

5. If then the *Quinoa* possesses such nutriment, and is so peculiarly adapted to high table lands, it appears to be the very kind of grain we want. I

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* The presence of the "grub" also is always indicated by a sort of "web" over the tunnel orifice, which is like the white-ants tunnel, only this web is elastic just as if made of a Spider web" with Saw dust *(discoloured) dusted* over it.

do not anticipate the slightest prejudice against its cultivation, and if a supply could be sent to me, I will undertake to see that Tara Chund, the energetic and enterprising Negee of Lahoul, gives the experiment of cultivating it a full trial. Our excellent friends, too, the Moravian Missionaries, who are true Pioneers of Civilisation as well as Messengers of Christianity in those parts, will also, I feel sure, be glad to cultivate the Quinoa.

6. Our chief difficulty, however, in Lahoul would be want of land, and, I may add, of cultivators. The mountain sides are steep, and it is only low down by the river sides that ground for cultivation is to be had. There are high plateaus between Losud and the Bara Lacha Pass, which are free from snow for about four and a half or five months, but then no wood is to be found there, and cultivation would be attended with great difficulty, even if the period would suffice for ripening the grain.

7. And the sparseness of the population, both in Lahoul and Ladak, would be against a large increase of cultivation such as Lieut. Pogson contemplates, at all events for some time to come.

8. But it would be invaluable, and would lead to most important results, if we could introduce an article of food that could be grown all along the route if the people only choose to take the trouble to cultivate it.

9 I trust, then, that you will be kind enough to favor me with some seed, and any directions that may be necessary for sowing it. I shall be happy to pay all expenses of cost, freight, &c.

10. In the same account of your Proceedings I observe a notice of China grass. You are perhaps aware that this fibre has been introduced into the Kangra Valley, and proves to be a most prolific plant If a Company of stability and capital were formed, or if any Settler with the requisite capital were to manufacture and export the grass, the profit from the transaction would be very considerable, even with all the disadvantages under which we labor of distance from the sea, heavy rates of carriage, and incomplete means of communication.

Resolved—That a portion of the *Quinoa* seed already applied for be placed at Mr. Forsyth's disposal. Further, that he be requested to favor the Society with full particulars regarding the cultivation of the China grass in the Kangra Valley.

RHEEA FIBRE.

Read the following extract of a letter from the Commissioner of Assam, to the Secretary to the Board of Revenue, L. P., regarding the present price of Rheea fibre (China grass) in that District :—

"The facts stated by Mr. McClintock are sufficiently well known in Assam. Indeed, some of the enterprising Manufacturers to whom he refers as having sunk money in making experiments, have had business relations with Assam in the matter. Attempts were first made to purchase the raw grass as brought into the market by the natives, but it was found that it cost nearly as much as the same article could be purchased for in London, if not more. Then an enterprising gentleman thought he would grow it on his own account, but this speculation equally failed. It was found with this Rheea, as it has been with everything else that has been tried in Assam, that deficient and high-priced labor more than neutralized any advantage of soil and climate. I enclose under a separate cover a specimen of the rough Rheea fibre as sold in Assam; and the present price of which at this Station (Tezpore) is one Rupee the seer or about (£ 108,) one hundred and eight pounds sterling the ton, calculated at the rate of 27 maunds to the ton.

I see Mr. McClintock speaks of raising the *Urtica* from seed, but the natives of Assam believe that the plant cannot be grown successfully from seed, and they propagate it entirely from root buds. These root buds are planted out in April and May, and the plant yields three or four crops in the course of the year. For instance, they are cutting it now, (July) and they will look to cutting it again in September or October."

The Secretary stated that the plant had not been raised by seed in the Society's garden. The Gardener had been very successful in propagating largely by cuttings from the young side branches with just a heel of old wood. Cuttings from old wood seldom succeed.

IMPROVEMENT OF COTTON BY THE SELECTION OF SEED.

The Secretary submitted the following letter (which he had received from the Board of Revenue, L. P.) from the Cotton Commissioner, Central Provinces and the Berars, to the address of the Honorary Agents, Cotton Supply Association, Bombay, regarding the measures taken in those Provinces to carry out Major Trevor Clarke's recommendations for the improvement of Cotton by the selection of Seed:—

"In answer to your enquiry I beg to state, that I duly received the printed copies of Major Trevor Clarke's interesting letter on the improvement of Cotton by purity of seed, which you were good enough to send me. They have been distributed among gentlemen who take an interest in Cotton cultivation, and who have consented to assist me by undertaking experiments during this season.

2. The important matter treated of by Major Trevor Clarke, regarding which Mr. Shaw, late of the Bombay Civil Service, whose success in Dharwar is so well known to you, was also good enough to write to me, has had due attention. Last year, before the picking of the Cotton commenced, I addressed the Officers in our Cotton-growing Districts, begging them to impress upon the people the importance of selecting the seed for this season's crop. During my frequent tours in the Cotton Districts I have not failed to explain to the cultivators the benefits that are likely to accrue from increased care in choosing the seed. In the Wurdah District, where the well-known Hinginghat Cotton is grown, several of the landholders—old friends of mine when I was in charge of the Land Revenue Settlement in that District,—followed the plan, that was carefully explained to them by Mr. Jones

c. s., Deputy Commissioner and Superintendent of Cotton Affairs, Wurdah, and myself. The best field of Cotton in the neighbourhood was chosen, and the largest bolls of the finest and healthiest looking plants of this field were then selected and picked. The kupas or uncleaned Cotton thus collected was kept apart and cleaned separate from the rest of the produce of the field, and the seed was kept for this year's sowings. A considerable quantity of the superior seed thus procured has been made over to me for sowing in the "seed gardens," which, in accordance with Major Trevor Clarke's suggestion, have been established at the head quarters of all the chief Cotton-growing Districts in these Provinces.

3. These seed gardens vary from 18 to 30 acres in extent, and are carefully selected fields, having good drainage, and good soil. They are in charge of Officers who have some knowledge of agriculture, and who take an interest in Cotton experiments. Near my own head quarters I have a seed garden under my immediate supervision.

4. In these seed gardens due attention will be given to "rogueing," the crop, as recommended by Major Trevor Clarke, and I hope next season to have a considerable stock of superior Cotton-seed of the indigenous Hingunghat variety,—a Cotton, which, you are aware, is second to none in India.

5. Much, too, has been done to "interchange seed." In the Hingunghat country the landholders sometimes do this among themselves. This season Hingunghat seed, *i. e.*, the best indigenous seed we know, has been sent in considerable quantities to our chief Cotton-growing Districts. To Kandeish, I have, as you are aware, sent a very large quantity—about 18,000 maunds—for Mr. Ashburner's operations. Considerable quantities have also been sent to the Districts of Berar and to the Nerbudda-lying Districts of the Central Provinces. The Cotton of the latter District bears a bad name, and the introduction there of the Hingunghat seed will not only have good effects which are known to attend the interchange of seed, but, it is hoped, will result in the adoption of an improved variety of Cotton. In the Nagpore and Chanda Districts of the Central Provinces, where a very good Cotton is grown, considerable quantities of seed have been imported, in the first case from Hingunghat, in the latter from the Edulabad district of the Provinces of H. H. the Nizam, which grows some of the finest Cotton that finds its way to the Hingunghat Market.

6. In the last paragraph of his letter Major Trevor Clarke refers to the importance of care being taken to procure foreign seed which can be really depended upon, and points out that the want of success with exotic seed has often resulted from the seed itself having been bad. With regard to the seed which is now being sown for experiments with foreign Cotton, I may mention that the acclimatized New Orleans Cotton seed used is in part that procured from Dharwar through the assistance of Mr. Walton, acting Cotton Commissioner. Experiments are also being made with selected seed picked from the Acclimatized New Orleans Cotton grown last year in the Wurdah District. As this seed may be considered to be now specially acclimatized to our climate, hopes are entertained of its prov-

ing successful Experiments will also be made with New Orleans and Sea Island Cotton seed, imported direct from America This seed was procured for me through the kindness of my friend Mr Rettridge, U. S. Consul at Bombay, and is of the finest description.

7. For the Egyptian Cotton seed, I am indebted to the kindness of Mr W. Christian of your firm, who, as you are aware, has taken great trouble to procure for me the very best seed, and has given me some valuable hints regarding the treatment of this variety.

8 I hope the above brief notice of what has been done in regard to the selection of seed, will show you that the important subject treated of by Major Trevor Clarke, regarding which you were good enough to address me, has received due attention. The whole subject will be noticed more at length in my report to Government, which, now that I have returned from my tour, will soon be submitted. I supply you with this information now, as I understand you to be anxious to inform the Association to which you are Honorary Secretaries of the action that has been taken in this important matter in which they take much interest, and to which, by printing and circulating Major Trevor Clarke's letter, they drew the attention of the public "

Letters were read,—

From the Secretary, Board of Revenue, enclosing copy of a letter from Dr. Corbyn, in which an application is made for seed of the Rheea plant for trial in the Garden of the Lunatic Asylum at Bareilly.

The Secretary mentioned he had replied that the plant was not raised from seed, and suggested an application to the Superintendent Botanic Garden, Saharunpore, for cuttings

From the Secretary, British India Association, intimating that the Association have complied with the request of this Society to distribute copies of the Circular on the Statistics of Rice cultivation.

The Secretary placed on the table many Returns already received to the Rice Circular, principally through the agency of the Association.—*Resolved* that the best thanks of the Society be given to the Association for their prompt compliance with this requisition.

From Colonel D. Gaussen, Dehra Dhoon, reporting on the failure of the acclimatized Japan Silk worms' eggs sent last year to Captain James Murray, at Mussoorie, at his request.

Wednesday, the 18th September, 1867.

A GROTE, ESQ., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz*:—

Messrs C. Lucas, J. O. Logan, Joseph Sladen, W. F Kruger, Lieutenant A. M. Shewell, Colonel Charles Prior, Dr Booth, Messrs. R. J. Clarke, Allan

Stokes, F. Bond, R Pyne, the Hon'ble J. B. Phear, Messrs. G. B. Pasley, Wilton Oldham, G. Woodbridge, Dr. W. Keates, Mahomed Ameer Hossein Khan Bahadoor, Secretary Local Committee, Chindwarrah, Major W. C. MacDougall, General N. F Nuthall, Secretary Local Committee, Jhansi, Messrs. R. L. Martin, R. A. D'O Bignell, Wm. Robinson Sherlock Hare, and Robert Stewart.

The names of the following Gentlemen were submitted as canditates for election —

C Macdonald, Esq., Dowlutpore Factory, *vià* Roosa, Tirhoot,—proposed by Mr. S. P. Griffiths, seconded by Mr H. F. Brown.

J. Buckingham, Esq., Tea Planter, Jorehaut, Assam,—proposed by Mr. S. Jennings, seconded by the Secretary

Hamilton Anstruther, Esq , Merchant, Calcutta,—proposed by Mr. Grote, seconded by Major Lees.

G W. Shillingford, Esq , Kolasy Factory, Purneah,—proposed by Mr. J. H. Gouldhawke, seconded by Mr H. S. Cave.

Dr. James Irving, Civil Surgeon, Allahabad,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

R. B. Smalley, Esq., Assistant Superintendent, Bengal Police,—proposed by Mr. T. H. Shortt, seconded by Mr. J H. Johnstone

S. E. Peal, Esq , Tea Planter, Seebsaugur, Assam,—proposed by Mr. Alexander Lawrie, seconded by Mr. T. H Lawrie

H. W. Stevens, Esq , Executive Engineer, Durbungah,—proposed by Mr. J. M. Becher, seconded by Mr James Forlong.

Secretary, Road Fund Committee, Jaunpore,—proposed by the Secretary, seconded by Mr. S. Jennings

Cunningham Hudson, Esq , Merchant, Calcutta,—proposed by Mr. W. Hinde, seconded by Mr Allexander Lawrie

The following presentations were announced .—

1.—A collection of Orchids from Chittagong, consisting chiefly of *Ærides odorata*,—from Mr. J. P Langlois.

2.—A small quantity (25) of Mahogany seed,—from Dr. J. D. Hooker.

3.—A good supply of seed of the "Phoolail" (*Bassia butyracea*), from Almorah,—from Major F. W Baugh.

4.—A specimen of fibre prepared from the bark of the Papeeah tree,—from the Maharajah of Benares.

5.—A specimen of fibre from the stalk of the Cotton plant,—from Dr. R. F. Thompson, of Hooghly.

The following is extract of Dr. Thompson's letter to Mr. Grote's address :—

"You are aware that I have been trying to secure for you a quantity of the *Gossypium* fibre. I have now been promised some from two or three parties. I have pleasure to enclose a small sample of this, prepared badly, but sufficient to shew its quality.

I know that you are, and have been for years, greatly interested in the new productions of India, and therefore I make no hesitation in laying this matter, of no little moment, before you.

At Dharwar, in the Bombay Presidency, no less than 3,78 000 acres of land is under cultivation at one time for Cotton alone. I find that after the cotton is collected the shrub which is annually destroyed, yields a good serviceable fibre, sufficiently strong to pack that very cotton in;—by throwing it away, there is an annual loss of Rs 22,68,000 at the very lowest calculation, *viz*:—

3,78,000 acres under cultivation.
3
———
11,34,000 biggahs.
2
———
22,68,000 each biggah will yield more than 2 maunds.

Value this at the lowest calculation, one rupee per maund, the loss is 22 lacs sixty-eight thousand rupees The shrub in its manufacture does not want steeping.

A report was read from a section of the Committee, Messrs T. H. Mosley and M Henderson, on the 3 samples of Cotton from British Burmah, which were submitted at the last Meeting by the Conservator of Forests. Nos. 1 and 3 are considered as poor, but No. 2, raised from Lucknow acclimatized New Orleans seed, is classed as a fair specimen of a most useful Cotton, of good color, average staple and strength of fibre

The Council submitted the following as an amendment of Section 4, Chapter III, of the Bye-Laws —

"Ordinary Members shall pay an Entrance Fee of 8 Rs.

They shall be liable for the full subscription for the quarter in which they may have been elected.

The subscription of Ordinary Members shall be 32 Rs. per annum, payable quarterly in advance, in sums of 8 Rs."

The Meeting agreed to receive the amendment, and it was directed to lie over for disposal at the next Meeting.

FLORAL EXHIBITION.

The following plants were sent in for competition —

From Mr W Ter Veen's Garden.—A fine well grown plant, in flower, of *Portlandia grandiflora.*

From Rajah Suttosburn Ghosal's Garden.—Eleven plants of *Caladia*, consisting of ten varieties, mostly well grown, and six Ferns of sorts.

From Mr. Grote's Garden.—A plant of *Antigonus latipes*, from seed from the Sandwich Islands, presented to the Society by Dr. Hillebrand in March last; of *Arundinia bambusifolia* and *Æschynanthus maculatus*, both from Sylhet, of *Dendrobium ciliatum*, and two plants of *Achimines* acclimatized at Moulmein.

Mr. Samuel Jennings shewed a collection of Ferns (*Pteris argyrea, Adiantum capellus Veneris, A. lunatum, Polypodium longifolium, P. crassifolium, Davallia*, 3 species, and some other kinds) tastefully arranged in a jardinière, and thus forming an ornament to a lobby, or entrance of a house.

Mr. Crawford and the Secretary, as Jurors, reported the award:—

To Mr. Ter Veen—of 3 marks for his *Portlandia grandiflora*.

To Rajah Suttoshurn Ghosal,—4 marks for his fine *Caladia*.

To Mr. Grote,—5 marks for his *Antigosus latipes*, exhibited for the first time.

NOTES AND QUERIES.

Query by Mr. D. M. Gordon in reference to the Lac Insect:

"What is the origin of the substance in which the Lac Insect envelopes itself, known in its natural state as Stick Lac, and, when prepared, as Shell Lac?

In the Report to Government on resinous substances published in the Society's Proceedings of 19th June 1867, the Commissioner of Patna says, "Lac is obtained from the spontaneous exudation of the Byr or wild Plum."

The Commissioner of Assam says "Shellac is produced by the puncture of the female of a small insect called *Coccus lacca*, on the young branches of certain trees." Colonel Sleeman, writing in 1838 on the Lac Insect (*Transactions*, A. and H. Society, Vol. VI.) calls it "the Matrix or Gum in which the Insects lie imbedded, as bees in their comb," but says nothing of its origin.

Is it a natural gum exuding from certain trees?

Is it collected by the insect as bee's wax by bees?

Is it produced by secretion as the cocoon of silk worms?

Is it an excrescence as the gall nut?"

Reply by Mr. H. G. French.—As to "what is the origin of the substance in which the Lac Insect envelopes itself, &c.," the best account is to be found in "The Natural History of the Lac Insect, by H. J. Carter, Esq., F. R. S., *vide* the Journal of the Agricultural and Horticultural Society of India, Vol. XI., Part IV., Selections, Page 37.

He asserts that "the Lac appears to be a secretion from the skin generally" and "again all begin to secrete from their bodies the resinous substance even before "they have fixed themselves to the bark; for those had it which were hatched from "the Lac on the branch that was first presented to me after the latter was dry "and dead, so that no doubt can exist of the Lac being produced by the Insect "itself, and that it is not a mere exudation from the tree which follows the inser"tion of its proboscis into the bark as has been stated."

The Lac Insect is to be found drawing its nutriment by puncture from the smaller branches of the

Koosum	... ...	*Schleichera trijuga.*
Palas	... ...	*Butea frondosa.*
Peepul	.	*Ficus religiosa.*

Bhot	*Ficus Indica.*
Pakur	*Ficus infectoria.*
Bhyr	*Zizyphus jujuba.*
Behaa	*Croton laccifera*m or *Aleurites laccifera.*
Soreepha	*Annona squamosa.*

all of these trees yield more or less a resinous, gummy, or saponaceous fluid.

The "Palas" in the months of October and November exudes from its stem a bright blood-red colored fluid which hardens quickly and has a brilliant polish, and is, so Royle, Roxburgh, Pereira and M. Guibourt, of Paris, believe, the true Gum Kino

The "Peepul," "Bhot" and "Pakur" in the cold weather yield to tapping a viscid fluid of which the Shikaries make bird-lime

The "Bhyr" bears a gum like that from the Apple tree.

And the *Croton lacciferum* in the months of April, May, and June abounds with a fluid from which the cow-boys manipulate and blow off large and strong air bubbles.

It therefore is natural to conclude that the Insect requires some such juices to exist upon, and that its functions are to form Seed Lac and Lac Dye according to the quantity and quality it draws from each description of tree for instance, it secretes when on the Koosum the most Seed Lac of a light color which makes the best Shell Lac, and the Palas, a redder stuff from which is obtained a garnet colored Shell Lac and a larger quantity of the deepest Lac Dye, just in the same manner as bees produce the best tasted honey and the deepest colored wax from Orange flowers and the poorest honey and lighter colored wax from the flowers of Orchids"

PROPOSAL FOR THE DIFFUSION OF AGRICULTURAL KNOWLEDGE IN BENGAL.

Read a letter from the Secretary to the Government of Bengal, dated 29th March, on the above subject.—

I am directed to forward the accompanying copy of a letter of the 2nd instant, from Mr John Stalkartt, proposing a plan for the spread of Agricultural knowledge in this country, and to request that you will be so good as to favor the Lieutenant-Governor with a report from the Society on the subject.

From JOHN STALKARTT, ESQ., to the SECRETARY to the Government of Bengal,—
(dated the 2nd March 1867)

SIR,—Now that the matter of Agricultural Colleges is before His Honor the Lieutenant-Governor of Bengal, I am emboldened to lay my plan, both simple and inexpensive, before him, which I think will tend to spread Agricultural knowledge over a very large number of villages and bring it home to the peasantry, whereas in Colleges the knowledge is but locally diffused, and this only to boys who, if they learn reading and writing, will want, as they grow up, to be sircars or writers, and the peasant, the real Agriculturalist, will not benefit in the least, A large building is not required, and perhaps at the commencement of such an undertaking, may altogether be dispensed with. I would not as yet bring in a professed Agricultural Chemist from England till the practical part was considerably improved, but commence with teaching and shewing them the value of extra labor in the fields.

Bullocks are so scarce and in many places inferior from various reasons that the natives do not sufficiently till the soil, especially in the cold weather, so that the crop is but small. To be certain of this, we have only to compare the yield of a field of wheat sown by an Indigo Planter who ploughs the land eight chass with the ordinary yield of land sown by ryots with two or four chass.

My plan is to get the zemindar to interest himself in the culture of the land, to assist the ryot by lending him improved ploughs and good cattle, and in consequence to receive a share of the increased produce, and, therefore, he will be interested in it.

To do this I would employ a practical Agriculturist of this country, whose duties will be to travel from Rajah to Rajah, or zemindar to zemindar, to persuade them to set aside 20 beegahs in each village, and stimulate the ryots to grow, with the assistance of the zemindar, and under his superintendence, one farm of twenty beegahs in every village, so that the amount of produce may be, if possible, increased

With the expenditure, the practical Agriculturist should have nothing to do, that should be the business of the zemindar who, of course, will do it as cheaply as possible, for labor is wasted in the villages, and, the results being known, prizes should be distributed to the successful competitors at the various local Exhibitions if possible, or perhaps a meeting might be instituted solely for the purpose.

In France there is the same difficulty of *small* farms, and the Emperor, to obviate this as much as possible, employs a number of Professors to make experiments, and travel through the country giving lectures.

The present Colleges give instruction to many people who afterwards go into Law—the curse of the country—or Government, or Mercantile offices, and there is no direct return for the heavy outlay expended upon them Whereas the peasantry, who have no assistance given them, pay about three-fourths of the revenue to Government; and I hope, therefore, that this little matter may be conceded.

To obtain the services of a good man a liberal salary should be given, say Rupees 700 per mensem, house allowance Rupees 150 per mensem, a tent, and the usual travelling allowance made by Government. As His Honor the Lieutenant-Governor of Bengal in conversation stated the difficulty there was in obtaining a good man, I take the liberty of proposing my cousin, Mr. John Stalkartt, late of Setulpore in Sarun, as a practical Agriculturist of more than thirty years both in Indigo, Sugar-cane, Wheat, &c.

On receipt of these communications the Council appointed a Special Committee consisting of Mr. S. H. Robinson, Baboos Joykissen Mookerjee, Ramanauth Tagore, Hurrochunder Ghose, Peary Chand Mittra and Mr. John Stalkartt, "to consider and report on the feasibility of this project in its present or modified "form." The Council now submit the following report from the Committee —

"The Special Committee appointed by the Council, at their Monthly Meeting in June last, to consider and report on the feasibility in its present or modified form of carrying out Mr. John Stalkartt's proposal, in his lettter to the Government of Bengal of the 2nd March 1867, for the spread of Agricultural knowledge in this country, have now the honor to state that they have given the subject full consideration and beg to report that, in their opinion, it is most desirable that Agricultural knowledge should be diffused both by lectures in Colleges and Schools, and by practical instruction to the peasantry on the field, *viz.*, by the establishment of Model Farms, setting aside 20 beegahs or so according to Mr. Stalkartt's proposal, in certain Sudder Stations in the principal Districts of Bengal. The Model Farms in the Sudder Stations of Districts where Colleges exist should be so conveniently situated as to afford the students of the Colleges an opportunity of gaining practical information in Agriculture.

If there be lectures only in the Colleges and Schools, the benefits will be but partially availed of in the absence of practical instruction, and will be confined to a limited number who may or may not turn such lectures to the purposes of life. The establishment of Model Farms, and thereby imparting practical instruction to those who are immediately interested in the soil, will not only promote an appreciation of the lectures in the Colleges and Schools, but diffuse a practical knowledge of Agriculture among those who constitute the real Agriculturists of the Country There are many matters in which your Committee conceive improvements are urgently called for, and a schedule of *desiderata* is annexed to this report.

The Committee are further of opinion that, all circumstances considered, the Government should take the initiative, and invite the zemindars and others interested in the culture of the soil, to assist them in this important undertaking.

The following are the principal subjects to which the attention of the Superintendents of the proposed Model Farms should be more especially directed —

1. The cultivation of lands by improved methods of ploughing in various ways, according to the nature of the soil.
2. Drainage and sub-soil Drainage.
3. The placing apart some portion of the land for green crops, such as Guinea Grass, Sugar Cane, Sorgho, Janeera, Bajra, &c , for the feeding of Cattle, so as to obtain manure.
4. Economising the natural manures of the Country— the Sun and the Rain.
5. Paving the Cattle sheds with tiles so as to collect liquid manure, and conserving the solid manure, so that it be not burnt or wasted.

6. Paying attention to obtaining superior seeds by picking out only the large grain; by changing the seeds if only from a distance of twenty miles; by selecting new varieties; and even by growing crops only for the sake of seed with manure for the purpose of distributing them to the cultivators.

7. Establishment of Dairies, both with respect to butter and cheese.

8. Careful attention to artificial manures, so that knowledge may be obtained of what to apply to each description of crops that may be required to be grown, with the view to increase the quality, quantity, and weight of the produce."

The Council adopt the above report, and recommend the carrying out of the Committee's suggestions on a small scale, and express at the same time their opinion that to ensure anything like success the cordial co-operation of the landholders, European and Native, is absolutely necessary.

Resolved,—That a copy of the foregoing Report be submitted to Government with the Council's recommendation.

NURSERY GARDEN.

Read the following correspondence with the Government of Bengal in reference to the donation of a piece of land in lieu of the ground the Society have been called on to vacate; and to the question of remuneration for permanent improvements made on such ground This correspondence is in continuation of that submitted at the Monthly General Meeting held on the 26th September 1866.—

From A. H BLECHYNDEN, ESQ., Secretary, Agricultural and Horticultural Society, to the SECRETARY to the Government of Bengal,—(dated the 17th January 1867.)

SIR,—I am instructed by the Council of the Agricultural and Horticultural Society to address you again, in continuation of my letter of the 18th May 1866.

2. On the 24th ultimo, I received another communication from the Superintendent of the Royal Botanical Gardens, No 105, dated 21st December, intimating his wish that the Society should vacate the remaining portion of ground still occupied by them as their Nursery Garden, within two months from the date of his letter. The Council are accordingly taking the necessary steps to meet this order, as your letter of the 16th August last, in reply to mine of the 18th May, leaves no alternative but to do so.

3. Though the Council fully admit, as they have already done, the right of Government to resume the ground in question, they think it due to the Society to take this opportunity of stating that such condition always appeared more as a nominal condition, the conviction on the part of the Society being that the continuance of the Garden was calculated to promote the objects of the Imperial Garden, and the Society, therefore, never hesitated to make large outlays in the improvement of the ground in such *bonâ fide* belief.

4. In communicating this proceeding, I am again directed to solicit the attention of His Honor the Lieutenant-Governor to the claims which the Council

conceive the Society have on Government for assistance in this emergency, and their confident reliance that such claims will be liberally considered. During the long period of thirty years that the Society have been in possession of the portion of land above referred to, they have, at considerable outlay, "converted a piece of waste-land into an useful and ornamental garden." For the first twenty years or so their operations were principally confined to the dissemination of economic plants, for which there has been a constant demand throughout the country, but for the last ten years, since the distribution of ornamental plants from the Botanic Garden has ceased, they have added this section to the other, thereby increasing to some extent their sphere of usefulness. From this latter period to the close of last year, fully one hundred thousand plants have been distributed inland, in addition to many Wardian cases by sea.

5. Since I last addressed you on this subject, the Council have been continuing their endeavors, but unsuccessfully, to obtain ground, either on lease or by purchase, on this side of the river, within a convenient distance of the city. They have consequently, in bringing this circumstance once more to the notice of the Lieutenant-Governor, to solicit again the aid of Government for the transfer to them of a piece of land, in an eligible situation, on which to form another garden. The Council have not overlooked the offer by His Honor of the slip of ground between the Alipore and Kidderpore bridges, but (as stated in my letter of the 28th February 1865) the conditions attached thereto by the Government of India, precluded the Council, in the interests of the Society, from accepting it.

6. Referring, however, to the difficulty of obtaining land in a centrical and otherwise eligible situation, if the Government of India were induced, on reconsideration, to waive the conditions which it attached to the grant of the ground between the bridges, and if the sum to be tendered in compensation for outlay on the old garden should provide the means of enclosing and improving this, at present, unpromising strip of land, then the Council, I am desired to add, would be willing to recommend the Society to accept the offer made in your letter of the 28th February 1865.

7. And, lastly, I am instructed by the Council to crave attention again to the subject-matter, first, of paragraph 6 of my letter of the 3rd February 1864, and secondly, of paragraph 3 of the 28th February 1865. It was stated in the first letter that the garden which the Society is now reluctantly obliged to transfer to the Botanic Garden, cost, to the close of 1863, the sum of Rupees 1,04,450. Since that time Rupees 18,000 more have been expended on it, or Rupees 1,22,450 in all. The portion alluded to of the second letter, I beg leave to quote for readier reference :—

"The Council confidently hope, taking into consideration the large amount "the Society have disbursed in the piece of ground which they are now called on to "resign, as detailed in paragraph 6 of my letter of the 3rd February 1864, that His "Honor the Lieutenant-Governor will be pleased to desire that a portion of this "sum may be granted to the Society as compensation for the expenses in which this "move will involve them, and towards defraying the cost of purchasing or renting "another site. The Superintendent is willing, the Society are informed, to take "over the Gardener's house and other erections on the land to be surrendered, and "the Society feel that they may fairly claim reimbursement, on a valuation of the "outlay, which has converted what was originally a piece of almost waste-land into "an useful and ornamental garden."

As the Council have not received any reply on this subject, they would again solicit that the question of a fair compensation to the Society for the buildings, roads, &c, on the ground which they are now transferring, may likewise be taken into early consideration.

From H. L. HARRISON, Esq., Junior Secretary to the Government of Bengal, to the SECRETARY to the Agricultural and Horticultural Society, dated Fort William, the 18th July 1867.

SIR,—With reference to your letter of the 17th January last, I am directed to forward, for the information of the Society, a copy of the orders of the Government of India, in the Financial Department, received under docket of the Home Department, No. 1912, dated 2nd instant, according sanction to the payment to the Society of the sum of Rupees 6,068 as compensation for the improvements made on the portion of the ground in the Botanical Gardens recently resumed from the use and occupation of the Society. The Lieutenant-Governor awaits the orders of the Government of India in regard to the proposal to make over to the Society the piece of land lying between the Alipore and Kidderpore Bridges and between the Circular Road and Tolly's Nullah, and on their receipt they will in due course be communicated to you.

Memorandum from A. H. HARINGTON, Esq., Officiating Under-Secretary to the Government of India, Home Department,—(No. 1912, dated Simla, the 2nd July 1867.)

FORWARDED to the Government of Bengal, with reference to letter thence, No. 1917, dated 23rd April last.

No. 881.

GOVERNMENT OF INDIA, FINANCIAL DEPARTMENT.

Simla, the 18th June 1867.

READ an endorsement of the Home Department No. 797, dated 31st May 1867, forwarding a letter from the Government of Bengal, recommending that Rupees 10,000 may be allowed to the Agricultural and Horticultural Society, Calcutta, as compensation for what they have expended on the lands in the Botanical Gardens which they have had to vacate, and that a strip of land on the banks of Tolly's Nullah be again offered to them.

RESOLUTION.—The Governor-General in Council observes that the Agricultural and Horticultural Society may fairly claim to be re-imbursed for the permanent improvement which they have made in the land that has been resumed by Government. The value of these improvements has been carefully ascertained by Dr. Anderson, and its amount, Rupees 6,068, may be paid; but the Governor-General in Council is precluded by the decision passed in Financial Resolution No. 2591, dated 3rd October 1866, from authorizing the payment of any larger sum.

ORDER.—Ordered, that a copy of this Resolution be sent to the Home Department and to the Accountant-General, Bengal.

E. H LUSHINGTON,
Secretary to the Government of India.

From A. H. BLECHYNDEN, ESQ., Secretary, Agricultural and Horticultural Society, to the SECRETARY to the Government of Bengal, dated 4th September, 1867.

SIR,—I have the honor to acknowledge your letter, No. 3131 of the 18th of July, forwarding for the information of the Agricultural and Horticultural Society a copy of the orders of the Government of India in the Financial Department, according sanction to the payment to the Society of the sum of Rs. 6,068, "as compensation for the improvements made on the portion of the ground in the Botanical Garden recently resumed from the use and occupation of the Society."

2. The Council having also had an opportunity of perusing the letter from the Superintendent of the Botanic Garden, No. 130, of the 11th April last, to your address, desire, before proceeding further, to explain in reference to para. 5 of that letter, in connection with para. 7 of my previous communication of the 6th February, that the Council never of course considered the large sum (Rupees 1,22,450) which the Society have expended on their garden as representing the actual value of the "permanent improvements" effected on the Government land. This sum, I may observe, was introduced partly for the sake of record, partly with the view of bringing prominently to notice how large an amount had actually been disbursed since the period this piece of ground was transferred to them in a state of "almost waste land," to the close of last year; and also to show that in their opinion the Society might fairly claim some reimbursement from Government on this account.

3. In the Resolution of the Governor-General in Council, which is introduced in the above orders No. 881, it is stated that the value of the improvement in question "has been carefully ascertained by Dr. Anderson," at Rs. 6,068.

4. Conceiving the above amount to be a very inadequate compensation for the cost of the buildings, roads, ghauts, &c., which have been constructed by the Society, I have been carefully comparing, with the records, the several items detailed in the letter of the Superintendent of the Botanic Garden to your address, of the 11th of April, and the report from the Curator of the Botanic Garden, therein referred to, and have submitted the result in a Memorandum to the Council, in which I estimate the value at nearly double that assumed by Dr. Anderson. I annex an extract, paras. 5 and 6, of this Memorandum.

5. With this Memorandum before them the Council have deemed it desirable, in the interests of the Society, to call for a professional report on the permanent improvements referred to, and I am now directed to enclose copy of an estimated cost from Messrs. Burn and Co. of erecting new Dwelling House, Out-offices, ghauts and sheds, and the reconstruction of roads, of an extent equal to those now on the piece of ground which the Society have been called on to surrender, amounting to Rupees 17,853 In their letter submitting this valuation-report, of which I enclose a copy, Messrs. Burn, and Co, it will be seen, are of opinion that the sum of Rupees 12,000 would be a fair price for permanent improvements as they now stand.

6. Under this explanation I am directed by the Council to request that His Honor the Lieutenant-Governor will be pleased to re-submit the question of compensation to His Excellency the Governor General in Council, and they hope that, on re-consideration, and with these facts before him, His Excellency will sanction payment to the Society of the sum of Rs. 12,000, which the Council consider the Society may fairly claim as reimbursement for the permanent improvements which they have made on the land that has been resumed by Government

7. The Council would add, in conclusion, that, taking into consideration the present high cost for labor, and the enhanced rate for building materials of every description, the sum above applied for (Rs 12,000) will necessarily fall short of the amount which will be required to enable the Society to replace, on a new site, the house, roads, ghauts and such other improvements as they are now necessarily surrendering to the Government.

Agreed—that the above correspondence be inserted in the Proceedings of this day's Meeting.

MANUFACTURE OF WINE FROM SUGAR-CANE JUICE.

Submitted the following two letters from Lieut. J F. Pogson, of Simla, dated 17th August and 14th September, suggesting that experiments be made, by those who are in a position to do so, for the manufacture of wine from Sugar-cane juice :—

"I have for some years past had it in contemplation to try the experiment of making a sound, substantial wine, from Sugar-cane juice, which should, as far as possible, possess all the properties of Grape wine.

I have lately ascertained that Sugar-cane wine, called "GUARAPO" by the Negroes, and "BASI" in *Luzon*, one of the Phillipine Islands, is not only made, but is highly esteemed. Under these circumstances, and taking into consideration the unlikelihood of my having an opportunity to carry out my intentions, I think it best to submit my ideas on the subject for the information of the Agricultural and Horticultural Society, under the hope that one or more of its Members may be induced to put so promising an experiment to the test, by making Sugar-cane wine in my place.

The expressed juice of the Grape, as we all know, deposits, during its fermentation, an Alkaline substance (known in Commerce by the name of White and Red Argol, being deposited respectively by White and Red Wines,) called crude Bitartrate of Potassa.

The juice of the Sugar-cane is extremely sweet, and during fermentation gives no Alkaline deposit.

The Grape juice is acidulous, owing to the presence of Tartar; and Cane juice sweet, for want of it.

Now, my idea is, that if we render fresh Cane juice acidulous, by dissolving a certain quantity of crude Tartar, or Argol, therein, so as to make it as aciduous and of the same density* as Grape juice, we shall, on the fermentation of such juice, obtain a *boná fide* Wine, which, during fermentation, will deposit any excess of Tartar, just as Grape juice does. Further, it is reasonable to assume, that if "Grape† must, feebly impregnated with sulphurous Acid, by running slowly into a Cask, in which a few sulphur matches have been burned, will keep without alteration for a year," so will Sugar-cane juice, holding a similar quantity of Argol in solution, keep for the same length of time if similarly treated.

The Wine so produced, may have the flavour of Red, or White wine, according to the description of Argol made use of, but as it will be wanting in Tannin, dried dates (called "Chúharah,") previously crushed, would have to be added, along with the Argol, to produce a Wine resembling that of the Grape. Fresh Pomegranate peel, or its flower buds, or any astringent flavoured fruit, green or half-ripe Guavas, for instance, would also have the same effect.

The first cask of Wine, so made, will solve this deeply interesting problem, and the development of a new and most lucrative trade will be the result.

The climate of Bengal will offer an obstacle to the manufacture of Wine, but if the Cane juice, prepared and preserved in the manner indicated, will keep good till the casks reach Darjeeling, from, say, Tirhoot and Purneah, the rest of the process of manufacture would be completed, under favorable circumstances, in a suitable climate, where the Wine would have to be stored till ripe, and fit for removal to the plains. From Azimgurh to Sealkote in the Punjaub, a suitable climate is to be met with for the preparation of Wine during the Sugar-cane harvest. But the finest Wines will of necessity come from the Dhoon, which possesses great advantages, for it has European capital, intelligence, energy and Sugar-cane available, and, in addition, a Hill Station, within a day's journey, to which all the newly-made Wine could be sent long before the hot season sets in. It would be premature to speculate on the market value of such (Sugar-cane,) Wine, but as it would possess great body, and Alcoholic strength, the London Wine Merchants would no doubt appreciate it as a fitting article for the improvement of weak Continental Wines.

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* Specific gravity of Grape juice in South of France, 1·0627 to 1·1283, Ditto, Neohu in Germany, 1·050 to 1·090; in Heidelberg from 1·030 to 1.001; see Ure's Dictionary of Arts and Manufactures, 1,201 Article—Wine.

Sugar-Cane juice specific gravity, 1·033 to 1·106, Ure, page 1,201, Article—Sugar.

† See Ure's Dictionary of Arts and Manufactures, page 1,203, Article—Sugar.

The experiment, I venture to submit, is worth trying, and if a supply of Argol (Red and White) could be obtained from France, or England, overland, and issued to experimentalists, at cost price, I think some of this year's Sugar-cane juice would stand a fair chance of being made into Wine.

14th September 1867.—In reference to my last letter on the subject of making Wine from Sugarcane juice, I think that until Argol, (crude Tartar) can be obtained from Europe, those desirous of trying the experiment might acidulate the Cane juice with purified Tartar, sold under the name of Cream of Tartar. This substance, I believe, contains all the components of Argol, with the exception of the coloring matter, which is of no. importance. Iron, no doubt, is present in the red, purple and black grape, and gives its color (red) to the wine —might not this result be attained, by adding a small quantity of the Citrate of Iron to the acidulated Cane juice?

It would be deeply interesting to try an experiment on fresh Date juice, and other Palm juice, to be met with close to Calcutta. Such juice after being acidulated might be put into casks, stored in the Calcutta Ice house, and be there fermented, and brought to maturity on the new plan, devised by Baron Von Babo, "one of the most intelligent agriculturists and wine-growers of the Grand Duchy of Baden." *Vide* page 244, Liebig's letters on Chemistry.

Should success attend this experiment, a vast and lucrative trade looms in the future.

The supply of Date and Palm juice is very extensive, and can be made more so.

The Ice Company can execute orders for American Ice to any extent. But British capital, and enterprise must be called into energetic action before a large Ice house, connected with *pucca* underground vaults for manufacturing and storing the new Wine, can be called into existence.

Nature has withheld the Grape from India, and other tropical countries, but she has given Cane juice, and Palm and Date juice in abundance in its stead, and if to this we add Argol, (the acid refuse of grape juice,) and by means of Ice, regulate the temperature, and fermentation, I see no reason why good, sound Wine should not be made in India.

It is said a good deal of Champagné is made from green Rhubarb-juice, artificially sweetened and fermented, and by following precisely the opposite plan, *i. e.*; acidulating sweet juice, a superior description of Champagne might be made. But, as a commencement, the mannufacturing a cask of white Wine will suffice."

Resolved, that the above letters be published in the proceedings of this day's Meeting with the view of attracting attention to the subject.

Letters were read—

1.—From Dr. Cleghorn to Mr. Grote's address, dated from Chepauk, Madras Presidency, 6th September, offering some remarks in reference to recent communications from Lieut. Pogson and Mr. Forsyth, regarding the introduction of certain food plants into the Himalayas and the high lands of Thibet. The following are extract of Dr. Cleghorn's letter —

"I have received your latter of 23rd ultimo, regarding the introduction of the Quinoa (*Chenopodium Quinoa,*) of South America, into the higher Valleys of the Himalaya as a new esculent. I am glad to learn that the Commissioner of Jullundur is trying to increase the food-supply of these hill-tribes In my Punjab Forest Report, and in the "Notes on the Vegetation of the Sutlej Valley," published in the A. and H. S. Journal 1865, Volume XIII, you will find a suggestion that seeds of food-plants should be supplied, and this has been done for several years by the A. and H. Society of the Punjab, partly through the agency of the Moravian Missionaries in Lahoul, who have given excellent help in this matter. One species of *Chenopodium (——?)* is cultivated near Kotgur; it was first noticed by T. Thomson and Hofmeister, and I have seen it occasionally above Rampoor. Leaves of all species of *Chenopodium* and *Amarantus* are eaten indiscriminately. The young fronds of *Pteris aquilina* (?) widely distributed over the mountains, are eaten boiled like the stalk of *Asparagus.* They are full of juice but are rather insipid. The seeds of *Chenopodium* carry well, and are possessed of long vitality. Buck wheat from Bussahir, which I brought down in April, has grown well on the Neilgheries, but the climate is not cold enough to ripen the fruit well.

The *Red Amaranth* grown by the Budagars on the Neilgheries and called *A. frumentaceus* by Buchanan, is identical with the Bathú of the N. W. Himalaya, which forms so remarkable a feature in the landscape at Simla, in October and November.

The new Zealand Spinach *(Tetragonia expansa)* has been grown to some extent in the gardens of the Punjab, and another kind of Spinach, *Chenopodium duricomum,* introduced at Madras by Sir W. Denison, is both nutritious and palatable: it is a native of tropical Australia, and would not probably endure a climate colder than Kotgur, although the family bear remarkable vicissitudes of temperature. Of the last species Mr. Sim, C. S., promises you a small supply of seed from his garden."

2.—From Major W. N. Lees, forwarding extract of a letter from Mr. John McKay, the Manager of the Punjab Cinchona Association, Kangra, of the 10th August, as evidence of the success of Cinchona cultivation in that locality.—

"The plants which were planted during last rains have grown wonderfully; they are from three to four feet higher now, and you will be surprised to hear that the plants of *Cinchona Calisaya* are in flower; one of them has flower spikes 4 inches long, white, and has a *sweet* odour. The first *plant* that flowered was one of *the two* which *I brought* from the Neilgheries the others are two of the seedlings which

I raised *from the* seeds which you *sent* me two years ago. These three plants are four feet high, and very bushy, almost like a four-year old Tea plant. The highest *C. Succirubra* is five *feet high*, double stemmed, and the highest *C. Pahudiana* is a regular tree 5 feet 8 inches high and lots of long branches.

I hope to be able to send you a pound of bark for analysis after the rains."

3.—From Dr. J. D. Hooker, Kew, dated 28th July, to the address of Mr. S. Jennings :—

"I wish that I could give you any hints about the cultivation of Orchids likely to be useful to you, but really I cannot; you seem to have succeeded beyond all precedent by semi-artificial means. I find that the *Anæctochili* grow best under bell glasses, (with plenty of ventilation) *colored green*. We failed for years in growing them, till this year when in three *houses* they are doing well under this treatment. We simply daub three-fourths of the glass with green paint. I suspect that the same treatment would suit *Sonerilas*, *Pleiones*, *Hymenophylla*, and many other plants. You might try Plantain leaves—which would have the further advantage of coolness."

4.—From T. B. Beyley, Esq., Wynberg, South Africa, advising dispatch of some Seed Wheat, from the Agricultural Society of the Cape of Good Hope, and indenting for a large supply of Seed Oats.

5.—From the Secretary, Government of India, Home Department, dated 10th September, applying on behalf of the Lieutenant-Governor of Natal, for two or three sacks full of seed of the "China Grass," or "Rheea." The plant is being cultivated and flourishes in Natal, but the seed obtained from it has hitherto not proved productive.

The Secretary mentioned he had replied to the effect that the seed is equally unproductive in Bengal, and had pointed out how easily this plant is propagated by cuttings.

For the above communications and presentations the best thanks of the Society were accorded.

Wednesday, the 20th November, 1867.

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last (September) Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz*:—

Messrs. C. Macdonald, J. Buckingham, Hamilton Anstruther, G. W. Shillingford, R. B. Smalley, S. E. Peal, H. W. Stevens, Cunningham Hudson, Dr. James Irving, and Secretary, Road Fund Committee, Jaunpore.

The names of the following Gentlemen were submitted as candidates for election as Ordinary Members:—

Colonel J. J. Murray, Commandant 14th Bengal Lancers,—proposed by Captain H. G. Currie, seconded by the Secretary.

Chowdree Roodurpurshaud, Nanpore, Tirhoot,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

The Hon'ble Wm. Grey, Lieutenant-Governor of Bengal,—proposed by Mr. J. A. Crawford, seconded by Mr. A. Grote.

R. Chapman, Esq., Merchant, Umritsur,—proposed by Mr. H. Cope, seconded by the Secretary.

Henry Beadon, Esq., C. S., Kooshtea,—proposed by Mr. Grote, seconded by Mr. Crawford.

Capt. C. Latouche, Assistant Political Agent in Kattyar,—proposed by Lieut.-Col. W. W. Anderson, seconded by the Secretary.

Lieut.-Col. B. Parrott, Stud Department, Buxar,—proposed by Mr. Grote, seconded by Mr. Crawford.

Capt. W. Kincaid, Assistant Political Agent in Bundelkund,—proposed by Major W. R. Alexander, seconded by the Secretary.

Capt. Godwin-Austen, Survey Department, Cherra-Poonjee,—proposed by Mr. Grote, seconded by Mr Crawford.

Capt. R. G. Birch, Fort Adjutant, Fort William,—proposed by Mr. B. Collins, seconded by the Secretary.

Charles Brock, Esq., Calcutta,—proposed by Mr. S. P. Griffiths, seconded by Mr. W. Stalkartt.

A. Walker, Esq., Merchant, Calcutta,—proposed by Mr. S. Jennings, seconded by Baboo P. C. Mittra.

The Collector of Mynpoory,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Dr. Hugh Cleghorn was proposed, on the recommendation of the Council, as a Corresponding Member of the Society.

The following presentations were announced:—

1.—Progress Report of Forest Administration in the Central Provinces, 1866-67,—from the Government of India.

2.—Journal of the Asiatic Society of Bengal, No. 2 of Part 1, and No. 2 of Part 2,—from the Society.

3.—Memoirs of the Geological Survey of India, Vol. VI. Part 2,—from Dr. Oldham.

4.—Notes on the propagation and cultivation of the medicinal Cinchonas, by Mr. G. McIvor,—from the Government of Bengal.

5.—Report on a visit to some of the Tea Districts of India, by A. Morice,—from the Author.

6.—Annual Report of the Administration of the Bengal Presidency, for 1866-67,—from the Government of Bengal.

7.—Small packets of seed of Tinnevelly Senna and of acclimatized Carolina Paddy,—from Dr. H. Cleghorn.

A quantity of seed Wheat from the Cape, of two kinds, the "early" and the "bearded,"—from the Cape of Good Hope Agricultural Society.

This seed has germinated well and is in course of distribution.

9.—A collection of flower seeds acclematized at Roungyoung (Darjeeling),—from Dr. Thomas Anderson.

10.—Seeds of *Clianthus Dampierii*,—from the Acclimatization Society of Melbourne.

11.—A small quantity of seed of *Conocephalus niveus (Urticaceæ)*,—from Dr. Bedie, Secretary, Agricultural and Horticultural Society of Madras.

This plant is stated to be a native of Southern India, and has some resemblance to the Rheea. "It grows as a shrub abundant in most of the Coorg Ghauts, and is common in the lower jungles of the Neilgherries, and various hills of southern India. Its bark, like that of the Rheea, contains a very fine and strong fibre, and it is easily propagated from cuttings.".

12.—Seven small plants of the Durian,—from J. A. Crawford, Esq.

The following is extract of Mr. Crawford letter.—

"These plants have been raised by me from some seeds which I obtained whilst down at Moulmein in July last. I planted 10 in all, but as they were sent up from Moulmein as they just germinated, three died on the way altho' they were in a small Wardian case.

These plants are from the seeds of the kind known in Moulmein as the Beeloogyoon Durian, so called from an island of that name in the Moulmein river just opposite to the town of Moulmein.

I am not at all up in the cultivation of this fruit, but I was informed when down in the Tenasserim Provinces, that the best mode of dealing with seedlings is to plant them in the shade of a tree, but just out of reach of the droppings of dew or rain from the boughs. Afterwards, when about 2 years old, to plant them out but to protect the stem from the heat of the sun by winding matting loosely round it, and this should be continued till the tree is some 7 years old, the period most fatal to the young tree being from the 5th to the 7th year. I give you these facts as they were told to me.

A Beeloogyoon Durian stands very high in local estimation in the Moulmein District. It seems to have a much richer custard enveloping the seeds than exist in the Bengal Jack fruit, added to which if a most sickly smell attaching to the fruit when ripe, and a most intolerable stench when cut, are any criterions of the quality of a Durian, I can warrant that the seedlings I have now sent are of the right sort.

I am not acquainted with what attempts, if any, have been made to introduce this fruit into Bengal, but provided our latitude is not too high, I should say that it would have its best chance on the chur islands in the Sunderbunds and lower parts of Bengal."

The Secretary mentioned that, at Mr. Crawford's suggestion, he had transferred one plant to Mr. S. P. Griffiths, and one to Mr. Wm. Stalkartt, the remainder he had sent down to the garden, where they had suffered from the late gale.

The motion of which notice was given by the Council at the last Meeting for amendment of Section 4 of Chapter III. of the Bye-laws was submitted, and agreed to unanimously.

A report was submitted by the Gardener on the destruction caused by the gale of the 1st November. Mr. Erington gives a list of the larger trees that have been entirely killed, and damaged; of fruit grafts, flowering plants, cuttings, cacti, orchids, &c., and of the damage sustained by the *pucka* and *cutcha* buildings, and bell glasses; of the latter 83, chiefly of large size, have been destroyed. The following are the remarks of the Gardener when forwarding the above list:—

"The returns now sent are as near as we can obtain, but the loss will be much greater than here stated, as many things will yet die from being injured. Our loss amongst flowering plants is not near so bad as in 1864, but I think much greater amongst young fruits; being much greater than I at first thought it to be. Amongst pot-plants many are much injured in the stem by constant chafings against the pot rims,—a few hours longer it would have cut many in two. The destruction amongst large trees I consider is owing more to the rain-fall than force of the gale, the latter not being so severe as the one in 1864, at least not so here, being able to hear so plain during the last, which we were unable to do in 1864. This year's gale does not appear to have descended so low as in 1864, which swept all before it, even small things; the latter appears to have left them untouched. Many of our young things were fully exposed and consequently suffered much less than those under shelter of trees."

Resolved, that the Garden Committee be requested to visit the garden and report in reference to the above.

PROGRESS OF COTTON CULTIVATION IN THE CENTRAL PROVINCES AND THE BERARS.

Several interesting reports on the above subject were submitted direct from Mr. Rivett-Carnac, the Cotton Commissioner, and some, through the Board of Revenue, descriptive of the state of the weather during the month of August;—of an experiment in the Nimar district last season with Hingunghat Cotton seed;—and on the prospect of the Cotton harvest in the Central Provinces and the Berars.

A communication from the Secretary to the Chief Commissioner, British Burmah, forwarding a report from Mr. Leeds, Conservator of Forests, British Burmah, on experiments to grow Cotton by the Forest Department, was also submitted. This and the other reports were transferred for publication in the Journal.

VEGETABLE PRODUCTIONS OF THE KANGRA VALLEY.

The Secretary submitted the following interesting notes from Mr. H. Cope of Umritsur, on the above subject, dated 26th December:—

"I have lately been in the Kangra Valley, going up by way of Jullundur and Hooshearpore, and returning by Noorpoor and Pathankote. I had promised myself the pleasure of sending you a few notes on my tour in the style of those you had from Murree last year and which you considered worthy a place in your Proceedings, but I regret to say the season has been against me, and that hardly anything in the shape of a flower met my eye during the whole tour; all the hill portion (from Hoosheearpoor to Dhurmsala, and from Dhurmsala to Pathankote) was performed on horseback with the view of commanding better opportunities of observation.

I had often heard of the beauties of Hoosheearpore as a fruitful district, or at least of those parts bordering on the outermost range of the sub-Himalayas that traverse its whole length from N. W. to S. E., but no description can do justice to the absolute agricultural magnificence that opened on the view as I approached the station of Hoosheearpore itself. Extensive groves, many of them of mangoes, afforded proof, by the size of the trees, of the depth and richness of the soil. Vast quantities of joar, maize, and other rain-weather crops, were just being garnered, while extensive fields of *sunn*, ready for cutting, and large tracts of sugarcane afforded evidence of the abundance of this year's harvest in particular. With the exception of the sandy beds of the hill streams that began to appear in numbers, every inch of ground seemed to be taken up, and the scene was more like one in Bengal that anything I could compare it to. There was, however, no room for wild flowers there. Not one even was to be seen as the ascent of the outer range commenced about five miles north by east of Hoosheearpore.

This range is, with here and there a few exceptions of sandstone cropping out, a curious model in clay, if I may so call it, of real mountain scenery, with its valleys, its gorges, its spurs, and its ridges. It is so far of a sub-montane character that close to its crest a few specimens of *Pinus longifolia* are to be seen hanging on the steep declivities of the southern face while larger numbers disport themselves on the northern aspect of the range. The wild *Karounda* is however the vegetation of this entire hill tract, interspersed with that *Justicia* that so largely affects the whole country along the foot of the Himalayas The skeleton of a Bhor (*Ficus Indica*) may be seen here and there, cropped to its bones (if I may so call the trunk and large branches) by the Camels travelling up and down, but hardly any thing else that may be called a tree.

On reaching the foot of this range to the north, you pass through the picturesque village of Gugiet (villages in the hills are very different from villages in the plains, generally consisting of a misshapen heap of low mud walls, with attempts at thoroughfares through masses of filth thrown out at random, while every house in the hills stands in the midst of its own holding) on to the wonderful groves of Umbota, and across the stream that forms the Juswan Dhoon. From the left bank of the Sohan—there are five or six more in the upper provinces, because they are all supposed to yield gold—the road runs first through richly cultivated fields, then thin jungles, and finally through a pine forest to the Dâk Bungalow of Barwain, on the very crest of the second range, whence the traveller enjoys a fine view in every direction, but more especially to the north-east.

I was struck with the great difference between the aspect of the northern hill sides of the Burwian ridge, cultivated wherever it was possible, and the southern, and by the change in vegetation. A very pretty pink *Barleria* was to be seen peeping out of the grass on the road side, while now and then an almost solitary *Clematis* exhibited its elegant white blossom, in token of what more the roadside no doubt can show at a more favorable season.

About four miles south of Burwain I first saw groups of the large Bamboo, for which this part of the Hoosheeapore district is known; some of them certainly were more than fifty feet in height.

Sand and boulders form the staple produce of the Valley of the Beeas proper, at the place where the road crosses that river, and neither are favorable to vegetable products.

Along the whole road from Hooshecarpore to Dehra, where the road crosses the Beeas (and thence on to Kangra) I met, however, droves of bullocks, with mules and donkeys for a diversion, laden with that staple of the Kangra Valley, which again reminds one of Bengal. Rice—rice—rice, was the invariable answer to the question as to what the animals were loaded with, and I can now understand the truth of the saying that the Kangra country produces Rice—Rocks—and Rice. Wherever I turned my eye, to lands along the ridges—to culturable lands on the tops of the ridges—to lands in the Valleys below, there was nothing but rice. The cultivation is not only general, but for the season of the year exclusive, and, from all I can hear, profitable in proportion.

I only regret that my time did not permit my passingt o the east of Kangra, and visiting the Tea plantations—that may be a treat for some other time; and if enjoyed, I will do my best to send you an outline of what I may see.

Kameela (the produce of the *Rottlera tinctoria*) is, I believe, now an article of considerable demand in England as a dye stuff, and medicament. Every third tree you meet with in some parts of western Kangra is a "*Rottlera*," so you may imagine what vast quantities of it exist in those parts. Enough, I should say, to dye half the clothes in the world, and to physic all its patients."

ATTEMPTED UTILISATION OF THE ARABIAN DATE PALM IN MOOLTAN.

Having referred to the subject of the Arabian Date Palm, as discussed at the Monthly Meeting in July last, under the head of "Notes and Queries," and more especially to the remarks of Mr. F. Le Beaufort, the Secretary drew attention to the following particulars which he had received from Mr. M. P. Edgeworth in a letter from London, dated 9th September 1867 —

"In reply to your favor of the 2nd ultimo, I beg to inform you that, as far as I could discover, the true Date was introduced by the Arabian Caliphs in the 9th Century when they conquered the country. The trees are planted in vast groves—very extensive at Dehra Ghazi Khan,—beyond the Indus—both sides of the Chenab, and up the Ravi, as far as Yolumbo near Bagdad—which are the tallest I have seen, upwards of 100 to 120 feet in height. The branches are very large and vary in color,—orange, amber or purple;—no fruit can be more excellent than they are when fresh.

The people live very much upon them during the season, and vast quantities are also procured, dried in the sun on the top of the houses, or on terraces made for the purpose.

There was one tree at Mooltan which had no stone (bedánâ) which was in former times considered a royal tree, and the fruit preserved for the reigning Sovereign (as also some of the peculiar Mangoes of Mooltan, especially the "*Shah pasand*" which had a thin skin, *smooth* stone, and most exquisite flavor.)

There used to be some fine true Date at the Botanical Garden at Saharunpore which bore well, especially in years when the rains are late—for the fruit is destroyed by rain, including disgusting grubs (I believe *Aomæ.*) That is, I believe, the reason why the true Date cannot flourish in Bengal. It requires a dry climate.

I attempted to utilise the endless groves of Dates by sending for a man from Jessore to draw the juice, but it was not successful, whether because the man disliked the climate and was anxious to get back to his home, or whether the juice was really, as he said, less fluid. He said the male plant did not produce as much juice as the female, and as the fruit was more valuable than the sugar, I was not anxious to continue the experiment which would injure valuable trees.

There are a few true Dates in the Lahore and Umritsur districts, a few also in the north parts of the Jullunder district, but they were seriously injured by drawing the juice for "*Sendhi.*" The wild Date was pretty abundant in the Umballa and Shajehanpore districts, and much used for the *Sendhi*, or toddy.

The male Dates are much used as rafters at Mooltan, and the "Cabbage" most excellent, either raw or cooked. The fresh fruit makes an admirable pudding, in taste like a plum-pudding, without its richness.

The peculiarity Mr. Beaufort alludes to in having more than one stem is remarkable. I believe the apparent branching is owing to the many plants germinating in the axils of the fronds. There is, or was, a remarkable specimen between Jhung and Maghiaris, not very far from the Cutcherry there.

Near Horkot there were some remarkable trees, quite serpentine, evidently in consequence of storms having blown them down and having grown up again, and again blown slanting.

At Mooltan there are trees in which attempts at branching had taken place, but not succeeded—that at Maghiaris is the only one I have observed in which the lateral branches (or trees) had grown to any size. In this case the main stem was about 12 feet high, the branches about 3 or 4. I speak merely by memory."

Manufacture of Wine from Sugarcane and from certain kinds of Fruits.

The following communication from Major J. C. Dickson of Barrackpore, in connection with the subject discussed at the last Meeting, was next introduced.—

"I have observed in this day's issue of the "Englishman" a letter on the manufacture of Wine from sugarcane juice by Lieut. J. F. Pogson, which letter was read at your recent Meeting.

Without wishing to detract from the scientific and valuable hints given on such an interesting subject, I take this opportunity of placing at your disposal experiments made by me on the same subject at Peshawur, some six years ago.

In the concluding para. of Lieut. Pogson's letter above referred to, he states 'Nature has withheld the grape from India, and other tropical countries.' Now, with a wish simply to avert doubts which any enterprising wine manufacturer may entertain as to not only the extremely luxuriant growth of grapes in the plains of India, (I need scarcely tell you that) the vine is indigenous to the Hills, and may be improved by cultivation.

On my arrival at Peshawur, as above stated, observing the luxuriant and extremely plentiful growth of grapes in the station, of varieties almost exactly similar to the very best Continental wine grapes, *viz.*, the small dark Burgundy—the large oblong Muscatelle, the full, dark, round, now so well known in Australia, from which the best Kuwarra wine is manufactured,—indeed similar grapes are, and have been, grown for many years past in many parts of India; both hills and plains, all through Rohilkund.

With a view to test the capabilities of the Peshawur grape for the manufacture of both wine and brandy, I made up a small Still, the numerous water-courses passing through the station I took advantage of. One running through my compound facilitated the working of my *Puthcen* Still, and amongst numerous visitors to witness my experiments in manufacturing brandy, I invited the then Magistrate and *Abkaree Officer* Captain W. Numerous Officers who visited the experiments (*viz.*, making Brandy wines of various kinds; sparkling and still,) being unanimous as to the entire success, many of them having tasted the brandy as it dropped from the worm of the Still, and the wines when being bottled, and after having been for some days in bottle,—the sparkling wines being Champagne, Moselle, and Hock. Amongst the Officers who tried the brandy and wines were some of the Officers of the 82nd Regiment. One Officer who tried the samples being at present close to you in Calcutta, I send you his card, with a hope that, should you meet him (and with a view to your forwarding the views of further experimentalists) you may fully satisfy yourself as to the practicability of not only making wine and brandy in the plains of India, but of manufacturing those articles of as superior a description as any that can be produced elsewhere. You will find that the apparent stumbling block notified by Lieutenant Pogson, that of producing argol, may be easily removed.

It may not be out of place to invite your attention to the fact of the very superior wine manufactured on the Continent from plantains, also the first class wines produced from peaches and apricots; also the fine brandies produced from these fruits. The Pomgranate, Pumelow, Jack, and numerous other fruits of this country, are admirably adapted for the manufacture of brandy and wine.

Since my departure from Peshawur, I have heard that a quality of wine closely resembling Champagne has been successfully produced in the Punjab.

I am now trying some experiments on brandy from the plantain, jack, and other fruits, and shall be happy, when my samples are ready, to send you some of them, and should you think it worth notice, I shall be glad to continue the subject at a future period."

PROPOSED INTRODUCTION OF CHENOPODIUM QUINOA INTO THE HIMALAYAS NORTH OF SIMLA, AND AT LADAKH.

A second communication on the above subject was submitted by Lieutenant J. F. Pogson, forwarding a copy of his correspondence with the Punjab Government. The following is extract of Lieutenant Pogson's letter :—

"For the information of the Agricultural and Horticultural Society of India, I have the honor to forward copies of letters which have passed between the Punjab Government and myself, on the subject of the introduction of the *Chenopodium Quinoa*, into the Himalayas north of Simla, and the high lands of Thibet.

His Honor the Lieutenant-Governor of the Punjaub, is not disposed to move in this matter until the Missionaries have been supplied with seed, and have sown, grown, and harvested the same under considerable and admitted difficulties. In fact, as the seed cannot be supplied to them this year, "no trial will be possible until another year shall have elapsed." *Vide* letter No. 519.

Mr. Forsyth, the Commissioner and Superintendent of the Jullundur Division, has taken the subject practically in hand, and if the Quinoa seed reaches him, (as I expect it will,) in a sound state, I have no doubt that the experimental cultivation carried out, under his orders, (and, perhaps, at his own expense,) will be crowned with success, and Doctor Caley will, I am sure, do his best in the matter at Ladakh, where, according to Moorcroft, (*vide* 1st No. of the Royal Asiatic Society's Journal, London, 1822-23,) a variety of Chenopodium grows wild, and reasoning from analogy, the cultivated species of the Andes should thrive and flourish. A kafila of one thousand ponies, laden with merchandise, is now rapidly approaching Ladakh, and as these visits will be annually repeated, perhaps on a larger scale, the necessity of introducing a grain like the Quinoa to meet the growing demand for food, for man and beast, in that direction is so obvious that comment is needless.

The Indian corn of America, the fruits of Europe, the Tea of China, and the Cinchona of Peru, all grow, and grow well, in suitable localities and altitudes, in the Punjab; why, then, should not the Quinoa of Peru grow as well?

As the Punjab Government have virtually declined to take the initiative in this matter, I venture to submit, that the Agricultural and Horticultural Society of India might move the Supreme Government of India to sanction a certain monthly expenditure, not exceeding Rs. 500, for the express purpose of cultivating the *Chenopodium Quinoa*, in the most favorable localities to be met with in British territory, close to Simla. I allude to the vast spurs of the "*Chore*" Mountain, where land at almost any altitude, from nine to twelve thousand feet, may be met with.

If this be sanctioned, a ten acre block could be very quickly selected, and the trees cut down before the snow falls, and next March the ground could be broken up, prepared and be ready for sowing in April. If no objection exists, a similar extent of land could be taken up within a mile of the Darun Pass, and as far from the Darun Dâk Bungalow, near the summit of the Pass. This block would be 9 200 feet high, and as the snow does not melt till the 10th of April owing to the difference of latitude, it would not be ready for sowing till the end of that month.

This expenditure (which should include the superintending Officer's salary, of at least Rs. 200 a month,) should continue, until the crop was harvested, and might be continued if the experiment was a success, and the results satisfactory.

In conclusion, I would wish to observe that no Hill Chief, or Paharee Zemindar, will enter on the cultivation of the Quinoa, unless we set them the example.

His Highness the Raja of Busahir reads the newspapers, and the Society's Proceedings, and if he saw that we were in earnest, he would join, and get his richer subjects, and Wuzzeers, to do likewise, but the mere fact of Government holding back is more than sufficient to justify him, and others, from doing the same."

In connection with the above the Secretary introduced to the Meeting a letter from the Secretary to the Government of the Punjab, enclosing the following extract of a communication from Dr. Cayley, on special duty at Ladakh, and requesting to be informed whether the Society can assist in procuring a small quantity of the Quinoa Seed, with a view to its being tried, on a small scale, in suitable localities.—

"I notice in the last report of the Agricultural Society of India, that a communication was received from Captain J. F. Pogson, of Simla, suggesting the introduction of the *Chenopodium Quinoa*, a new description of grain extensively cultivated and used for food on the high table lands of Chili and Peru, and that he was recommended to communicate on the subject with the Government of the Punjab. The plant was described as flourishing at an elevation of 13,000 feet above the Sea. With reference to the above, I may observe that in Ladakh, Wheat of very good quality grows at an elvation of 11,500 feet, and is everywhere found up to 11,000 feet. Beans and Buck wheat up to 12,000 feet—Peas up to 13,000 and Barley, of which there are 2 kinds, grows regularly up to 13,500 feet, and even higher; the crops at Karding and at Gyah, at that elevation, are very fine. Barley is even grown so high as 15,000 feet as seen at Hanli and near the Isomoriri Lake and I believe in parts of Spiti, elevation above the sea, which probably only acts by diminishing the mean annual or perhaps the mean summer temperature, has a most powerful effect in retarding vegetation, but it is not the only nor even the most important cause of the comparatively small extent of cultivation in Ladakh and Lahoul; in the former especially the area of cultivation may be said to be limited by the want of land and want of water. The wide plains of Rupshu are uninhabited and uncultivated, as there is no supply of water, and on Ladakh proper the only lands cultivated are on the banks of the large rivers, when they are not too high above the water for irrigation, and the lower ends and deltas at the mouths of all the side valleys in which there is a perennial stream of water, as is only the case when the hills rise to above 18 or 19,000 feet,—the perpetual snow line being seldom below that. The entire surface of the country consists of either rock or rocky *débris*, the best soil being only coarse granite sand mixed with a little clay; there is nothing approaching to vegetable mould, and as rain is almost unknown, no crops grow unless continually irrigated from the time of sowing up to harvest, so that before introducing the Quinoa into Thibet and similar countries, it would be advisable to make careful experiments as to whether it will, in these regions, flourish at a higher altitude and under conditions of rocky soil and want of water, where barley will not grow, or, if it will at somewhat lower elevation, yield a more profitable crop than those now generally sown. In the more southern Himalayan regions where the cultivation seems to be more limited by mere elevation and diminution of temperature than in Ladakh, this grain might be found most useful, and it would be well worth experimenting with it in Lahoul, Spiti, and Ladakh, but at first only on a small scale to test its qualities and suitability to the climate and country."

As bearing on the above subject the Secretry read the following brief extract of a letter from Dr. J. L. Stewart, Conservator of Forests, Punjab, dated 25th September:—

"In your various *Chenopodium Quinoa* correspondence, I see no mention of the fact that allied plants *are* cultivated in our Himalaya. I have no authorities within reach to consult as to the actual qualites of the Quinoa, but I think we want more evidence ere we can be very hopeful about it for this part of the world. The same heights in the Andes and in the Himalaya don't mean the same thing."

When the above was written Dr. Stewart had not seen the remarks of Dr. Cleghorn in the September Proceedings alluding to certain kind of *Chenopodium* and allied plants, especially *Amaranthus frumentaceus*, the "Bathu" of the N. W. Himalaya, to which, at the President's suggestion, it was agreed the attention of Lieut. Pogson should be directed.

MISCELLANEOUS COMMUNICATIONS.

1.—From the Secretary to the Government of India, intimating that the Governor-General in Council is unable to relax the rule in respect to the mode of packing parcels sent by the Packet Post, which requires that such parcels should not be sealed or packed in soldered tin or otherwise closed against inspection. "It is open to the Society," adds Mr. Lushington,—"under the rules, to have the seeds for distribution packed in wax cloth bags tied at the mouth in a way that would admit of their being untied for the purpose of inspection, or in transparent bags, the bags being, if desired, placed inside a box of tin or wood with the lid fastened down by a string."

The non-compliance of the Society's request, the Secretary observed, neutralizes very materially any benefit that the Society might derive from the Pattern Post mode of despatch, as seeds are of too perishable a nature to be forwarded, even a short distance, by this mode of conveyance, without probable injury, especially during the rainy season—the period of the year when the principal portion of supplies imported from other countries are distributed by the Society throughout India.

2.—From Junior Secretary, Government of Bengal, submitting a plan from the Superintendent of the Botanic Garden, and requesting to be informed if the Society are prepared to co-operate in his scheme for the distribution of plants, so far as they relate to the Society.

The Council report that having fully considered the subject matter of this letter, they are of opinion that no definite reply be given thereto till an answer is received to the application for a site for a new garden. Agreed to.

3.—From Lieut.-Col. A. W. Owen, Roorkee, reporting most favorably on the trials of Pedigree Wheat and Oats received last year from the Society:—

"Last year the Pedigree Wheat and superb Oats you so kindly sent me, thrived beautifully at Allahabad; my garden was visited and admired by very many Europeans and natives; all expressed great surprise at the Wheat and Oats. Unfortunately I was transferred from Allahabad before either ripened. No care was taken after I left, so I know not the actual result."

In reference to the above, the Secretary observed how desirable it would be if more reports of this nature were sent to the Society. The distribution of cereals and other field seeds had been constantly maintained for several years, and to many Members: but, unfortunately, very few returns had been received. The Pedigree Wheat above referred to was sent from England by Dr. Forbes Watson early in 1866 and distributed in October. The Oats were from Australia.

4.—From J. C. Wilson, Esq., C. B. dated from Wellington, New Zealand, in respect to two glazed cases of Tea plants forwarded to him last year, and applying for a further supply:—

"You will be glad to hear that the Tea plants in the uninjured case are doing very well. There are 3 or 4 sickly plants in the injured case.

I feel almost assured that if the young Tea plants are sheltered and protected from the rays of the summer's sun, and from the effects of the north winds, (which prevail, for ten days at intervals, during the hot months,) for two years, that they will thrive when planted on slopes with a southern aspect."

5.—From T. D. Forsyth, Esq., Dhurmsala, dated 17th September, intimating that, with reference to the Society's requisition, he has requested the Secretary to the Government of the Punjab to forward a copy of a report and prospectus from the Manager of the China Grass Company of Kangra: "The cost of preparation ought not to be very heavy," observes Mr. Forsyth,—"as we have any amount of water power to work machinery; and labor, as yet, is comparatively cheap in the Kangra district. But there is a tendency in price of every kind to rise, and the cost of carriage at present in the Punjab is exceedingly heavy. Still, with all these drawbacks, I believe the Manager of the China Grass Company is quite justified in estimating the profit of manufacture and export at 16 per cent."

The Secretary placed on the table several copies of the prospectus above alluded to, which, however, affords no decided information on the most important point, namely, the actual cost of preparation by machinery; for it merely states that, "by the use of machinery, the fibre can be extracted, of a quality superior to that hitherto exported, and the cost of preparation greatly reduced."

6.—From Dr. Geo. Bedie, Secretary, A. and H. Society of Madras, enquiring if there are in any of the Proceedings or Journals of this Society any articles on diseases of plants in India, or insects that have proved injurious to crops or garden trees, as he is about, by order of Government, to enquire into the subject of the Borer insect, now destroying coffee estates in southern India.

The Secretary mentioned that he had sent Dr. Bedie several copies of the publications of the Society bearing on the above subject.

7.—From the Secretary, Cape of Good Hope Agricultural Society, advising the despatch of the seed Wheat, already noticed, and applying for a further supply of seed Oats :—"Our Committee"—remarks Mr. Holding,—"are particularly anxious to procure some more Bengal seed Oats, as they are found to surpass all others in this climate, and I am instructed to solicit your kind assistance in this matter." In a subsequent letter Mr. Holding writes for an additional supply, as unfavorable accounts have been received from many of the grain districts, the rust having again attacked the Oat crop. "The farmers here," adds Mr. Holding—"are going in extensively for Tobacco growing, and have lately made such marked improvements in the manufacture of the article, (though much has still to be learnt) that, I believe, we shall soon be able not only to shut out foreign Tobacco, but export our own in large quantities. Seri-culture is also attracting much attention, and any hints that you may be able to give our Agricultural community regarding this branch of industry, will be highly appreciated. One mulberry is indigenous to the Cape, and all imported varieties grow luxuriantly: an industrious and enterprising population is alone wanting to fully develope this new and valuable product."

The Secretary intimated that steps had been taken to meet the above requisitions.

8.—From Monsiur F. Lotteri, submitting a few printed reports on trials with the Moonga Silk of Assam. Mr. Lotteri gives figured statements of the cost of production, &c., and states that the result is very favorable. He concludes with the following remarks :—

"His Excellency the Minister of Agriculture, Industry, and Commerce, in the Kingdom of Italy, having had the new Silk produced by my system examined by a Special Commission, a report was printed for the information of the cultivators and proprietors of land of the Kingdom, with the object of having the cocoons reared as soon as possible so as to make good the deficiency in the mulberry cocoons.

Since the Italian Minister wants to introduce the cocoons in question in Italy, where land and labour are much higher than in Assam and India in general, there is no doubt that English capitalists in this country would make much more profits than those of Europe.

This industry presents itself under *very* favourable auspices, and any one wishing further information on the subject will receive it by applying to the undersigned."

9.—From Messrs. Vilmorin, Andrieux & Co., Seedsmen of Paris, advising the despatch, to meet the requisition of the Society, of a trial assortment of 100 packets of flower seeds. These have been received and are in course of distribution.

For the above communications and presentations the best thanks of the Society were accorded.

Wednesday, the 18th December 1867.

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Ordinary Members, *viz :*—

Colonel J. J. Murray, Chowdree Roodur Pershaud, the Hon'ble Mr. Grey, Messrs. R. Chapman, H. Beadon, Charles Brock, A. Walker, Captain C. Latouche, Lieut. Col. B. Parrott, Captain Wm. Kincaid, Captain Goodwin-Austen, Capt. R. G. Birch, and the Collector of Mynpoory.

Dr. Hugh Cleghorn was elected a Corresponding Member.

The names of the following Gentlemen were submitted as candidates for election :—

E. C. Vancutsom, Esq., Merchant, Calcutta,—proposed by Mr. S. Jennings, seconded by Mr. H. Reinhold.

Frank Taylor, Esq., Ex.-Engineer, E. I. Irrigation and Canal Company, Hidgelee, proposed by Mr. R. V. Stoney, seconded by Mr. W. F. Krouger.

A. M. Monteath, Esq., Director General of Post Offices,—proposed by Dr. C. Fabre Tonnerre, seconded by the Secretary.

The Secretary announced the presentation of three plants of *Araucaria Bidwillii* from Mr. G. Livesay, and a packet of "Wormwood seed" from the Government of India, which was included among the presents received from the King of Burmah at the late Mission to the Court of Ava.

Nursery Garden.

A report was brought up from the Garden Committee on the condition of the Garden after the recent gale. The Committee report that they found the garden much in the damaged state represented in the Gardener's report, which was submitted at the last Meeting. "Nearly all the trees, of larger growth, have been prostrated;

some of these are entirely destroyed, whilst others, especially mangoes of the smaller kinds, may possibly be restored by judicious lifting. This they have instructed the Gardener to do with as little delay as possible. For this purpose they have authorized the engagement of extra hands, if procurable.

A good portion of the smaller plants may be recovered. The loss in roses has been severe, especially of the rarer kinds, but the Gardener hopes to be able to recommence distribution, on a small scale, in the course of next month.

The Committee have instructed the Gardener to restrict his additional expenditure to repairs of the Coolie lines, to certain small repairs required for his dwelling-house, and to a few thatch coverings for protection of the more tender plants. They have also authorized the purchase of some bell glasses, which are needed to replace, partially, the large number that have been destroyed."

PROVISION OF SEEDS FOR 1868.

A recommendation was submitted from the Council in respect to the indents for seeds for next season. The Council recommend the usual supply from America. As, however, many complaints have been received of seeds supplied this year by Messrs. Carter and Co., especially of the flower seeds, the Council propose that the order for these seeds be given to Messrs. Vilmorin, Andrieux and Co., of Paris, whose experimental supply this season has proved so satisfactory, and that the order for vegetable seeds be divided between this firm and Messrs. Carter and Co.

A number of letters were placed on the table reporting on Messrs. Carter & Co's seeds, the majority unfavorable, especially those from the lower provinces. A very full report was submitted by Mr. J. A. Crawford, the result of his sowings of the English flower seeds and of the French flower seeds, above referred to. Mr. Crawford's report is favorable to both.

The President remarked that the report which Dr. Hooker had kindly furnished of the result of the sowings of Messrs. Carter's seeds at Kew, and the favorable returns given by a few of the Members, would tend to shew that the seeds were in good condition when despatched from England, but, as they had not generally given satisfaction, it would be desirable to adopt the recommendation of the Council. He would suggest, in addition, that notice be at once given to the Members by advertisement, requesting them to intimate, within a month's time, whether they would prefer a selection of Carter's or Vilmorin's vegetable seeds for next season. Agreed to.

The Secretary placed on the table a number of returns to the Society's Circular issued in July last, on the subject of statistics of Rice cultivation.

Agreed,—that these be published in the next number of the Journal, Part 2, Vol. 1, New Series. (A few copies of Part 1, just received from the Press, were placed on the table.)

NOTES AND QUERIES.

Mr. A. Eliott Russell of Burdwan, submits the following queries in respect to the management of certain ornamental plants —

"Can you get me some good advice with regard to the growing of Gloxinias? I have some choice bulbs that have just come out from Geo. Martin, who tells me that they are very good indeed. I am anxious to make the best of them. Ought they to be put into the earth at once, or had they better be kept, and when should they be planted? Likewise, I am anxious to learn how to keep them in beauty during the hot season, which is rather trying for them. I did think that, perhaps, they might be kept in the house during the hottest portion of the day, as I heard that a modified light suits them.

Also, I have fine healthy plants of *Pelargonium* and Tom Thumb Geraniums and Fuchsias that I have brought from the hills; can you give me any advice as to the best plan to pursue to force their growth, and to cause them to flower nicely? I do not see why they should not do well for the first year, as I have seen *Pelargoniums* in beautiful flower at Bhaugulpore."

The following information from Mr. Errington, the Society's Gardener, in regard to the above, have been received since the Meeting was held. They are introduced here in anticipation of further replies from other quarters :—

"*Gloxinias.*—The Gloxinias should be potted at once in a mixture composed of well decayed vegetable matter, adding a little sand, making the mixture very light. Drain the pots well and place the bulb level with the rim of the pot, covering a portion of the bulb. Occasional dampings of surface are required at first, say until a good shoot has formed,—as the roots are near the surface and very fine, heavy waterings would soon destroy them. When the plants are in a free growing state they should never be allowed to become dry. Under glass is (I believe) the only way to grow them in India, but they may succeed in the new kind of structures in which Orchids are now grown. The covering, if of grass, should be thin, so as to admit a little light. About the same treatment Achimenes require would suit Gloxinias, except the latter need more care in watering I have had no opportunity of trying them under the new Orchid houses, as we have not had any bulbs since we erected them.

Geraniums.—The best method I find of growing Geraniums is to re-pot each season, about end of November, shaking away all old soil, and pot afresh in a mixture of well decayed vegetable matter and add a pinch of sand, press the soil firm and place the plant near level with pot-rim, placing a small stick to keep firm till rooted. When potted, place on north side of a house or tree, fully exposed to all except sun. Water slightly until well started, say when there are new shoots a couple of inches long, then fully expose them to the sun, and water more freely. Never allow them to suffer for want of water, as it soon causes the lower leaves to decay and fall off, and makes the plants unsightly. When the rains commence, fill each pot with soil up above the rim to ward off heavy rains, renewing as it washes away. They are also the better for placing on a brick or in double pots; this keeps the drainage open, also prevents worms entering.

Fuchsias.—Fuchsias require potting in same mixture as Geraniums, with good drainage. When in a free growing state, water freely; if only a weak growth, water very carefully. They should be kept on north side of a house fully exposed to all but sun; perhaps they might do well with same treatment as Orchids receive; but if under cover, it should be very thin above, so as to admit a good portion of sun-shine, and also prevent them from getting drawn up too much, if the latter, they will not bloom, or if so, very sparingly; it is only from a good well matured growth that a good supply of flowers can be obtained."

Read the following letter from Dr. J. L. Stewart, dated from Lahore, the 9th December, in respect to Mr. Edgeworth's communication submitted at last Meeting:—

"I have got your sheet of Proceedings (since your note of 27th ultimo.)

The several stemmed Date Palms, alluded to by Mr. Edgeworth, are noticeable about Mooltan and Mozuffurgurh, but are rare or absent wherever else I have been, the trees most common (as about Dehra Ghazi Khan where they are thickly scattered over the country for miles). They have been very erroneously supposed to be the Doum Palm of Egypt. I quite agree with Mr. Edgeworth that the secondary stems owe their origin to seeds, germinating in the axils of existent or fallen leaves. The odd thing is why the phenomenon should be local.

In addition to the uses mentioned about Mooltan, &c., the *rete* which forms quite a net about the base of each petiole is made into a rope which is said to stand alternate wetting and drying well.

The stems of the male trees are often cut down for the timber, but the roots do not rot easily and wont burn, so give some trouble. The wood is said to last, as a beam, in the dry climate there, for five or six years. It is also used to support the earth of small bridges, and for water channels, &c.

I was told that there were several *Bédana* Palms at Mooltan, that some of the fruit of these have stones, and that they bear fruit largely. Except the fruit there is said to be no distinction from other trees. For any one liking sweets, these *bédana* Dates are delicious."

Read extract of a letter from Dr. A. C. Maingay, of Malacca, to Mr. Grote's address:—

"I have been collecting for the last three years information regarding the timber trees of this District, and I was thinking of drawing up a report upon them for the Agricultural and Horticultural Society, prefacing a short account of the natural orders best represented in the Straits, and accompanying the report with a dried specimen of each tree, the latter to be mounted in the form of one or two Fasciculi, so as to be readily consulted. Do you think such a report would be acceptable? In addition to the Botanical descriptions of the trees, I caused a block of timber to be cut from each tree described; but as this latter operation did not take place under my own immediate superintendence, there is here a source of fallacy; but so far as I could discover, the timbers fairly corresponded to the trees. Should I therefore add the description of the timbers also to the report?"

Dr. Maingay's offer has been thankfully accepted.

Read also extract of a letter from Mr. T. B. Bayley, of the Cape of Good Hope, dated 21st October —

"I hope we shall get the Seed Oats, &c., as the rust is very bad in our own Oats this season in some parts of the country. This is quite a new decease in *Oats*. Till last year it was never heard of in the Colony, though common in wheat. As far as we have seen, the rust attacks all kind of Oats, and in wet seasons as well as dry; and there is no remedy for it as far as we yet know. It is a cruel visitation, and renders the prospects of our farmers more gloomy than ever. Of course, horse breeding will be much affected in consequence. As it is, horses are very scarce."

At the close of the Meeting Dr. Anderson exhibited a series of Photographs of branches of Cinchona, also of flowers and panicles of seed vessels and of young Cinchona trees taken by Dr. Simpson in the Government plantations in Sikkim. The original specimens of the branches, &c., from which the photographs were taken were shown at the Meeting dried and mounted on paper in the manner adopted for specimens of plants in the Herbarium of the Botanical Gardens.

Dr. Anderson stated that the largest plant of *C. succirubra* in the Government plantations near Darjeeling was 13½ feet in height on the 31st October. It was planted in the open air on the 15th October 1864, when it was 6 inches high. 250,828 plants of *C. succirubra* had been planted in the open air up till 30th October 1867. The plants of this species are placed at 6 feet apart, thus giving an area of 207 acres planted with *C. succirubra* or the Red Bark. A few good seeds had been obtained from the oldest plants of this species at Darjeeling, and promising young plants had been raised. The varieties of *C. officinalis*, the Crown Bark, are planted at 5 feet apart. 130, 919 plants of the varieties of this species are in the permanent plantations spread over an area of 75 acres. Some of the plants have yielded a considerable amount of good seed.

C. micrantha is not a quinine yielding species, and therefore, although it is one of the most beautiful of the genus Cinchona, and grows well in Sikkim in a subtropical climate, its cultivation has not been so vigorously prosecuted. Only 5,568 plants of this species have as yet been planted in the open air at 6 feet apart. At first much difficulty was experienced in growing *C. Calisaya* in Sikkim; this plant has proved to be equally intractable in Java, Ootacamund, and in Ceylon. This species "the queen of all quiniferous Cinchonæ" and the one whose bark fetches the highest price in the London market, has during the last 6 months been most successfully cultivated in Sikkim. The proper elevation for the open air plantations has been ascertained by repeated experiments, and the plants there are now in as good health as the finest plants of *C. succirubra*. The cultivation of *C. Pahudiana* the species which still forms the bulk of the Dutch plantations in Java, has been abandoned at Darjeeling for some time in consequence of the inferior quality of the bark; the number of plants is slightly above 5000. The old plants of *C. Pahudiana* have flowered this year and have produced seed.

The following is a descriptive list of the photographs exhibited by Dr. Anderson.

A. No 1.—*C. succirubra* Broad leaved, dark green variety. From a plant 2 years and 9 months old, growing at plantation No. 5 at Runbee near Darjeeling.

A No 2.—*C succirubra.* Narrow leaved, pale green variety. From a plant 2 years and 9 months old, growing at plantation No. 5 at Runbee near Darjeeling,

A. No. 3.—*C succirubra.* Portion of plantation No. 5 at Runbee near Darjeeling. showing the tallest plant of *C succirubra*, age 2 years and 9 months. The Head Gardener in the picture is 5 feet 9 inches in height.

B. No. 1.—*C. officinalis var Bonplandiana.* From a plant 2 years and 9 months old, growing at No. 4 plantation at Runbee near Darjeeling. Flowers with long stamens and short style.

B No. 2.—*C. officinalis var Bonplandiana.* Portrait of the plant in plantation No. 4, from which the branch figured in plate B. No. 1 was cut. This plant is 2 years and 9 months old.

B No. 3.—*C. officinalis var Bonplandiana.* From a plant 2 years and 9 months old, growing at No. 4 plantation at Runbee near Darjeeling. Flower with long stamens and short styles.

C. No. 1.—*C Pahudiana.* From a plant 3 years old, growing at plantation No. 5 at Runbee, near Darjeeling. Flowers with long stamens and short styles.

C. No 2.—*C. Pahudiana.* From a plant 3 years old, growing at plantation No. 5 at Runbee, near Darjeeling. Flowers with short stamens and long style.

C. No. 3.—*C. Pahudiana.* From a plant 3 years old, growing at No. 5 plantation at Runbee near Darjeeling.

D. No. 1.—*C. lanceolata* introduced from Java in 1861 as *C. Pahudiana* From a plant 3 years old growing in plantation No. 4 at Runbee near Darjeeling. Flowers with long stamens and short style.

A vote of thanks was given to Dr. Anderson for the exhibition of the above photographs, and for his remarks thereon, and for all the other communications the best acknowledgments of the Society were also accorded.

A. H. BLECHYNDEN,
Secretary.

REPORT

OF THE

Agricultural & Horticultural Society

OF INDIA.

Report from the Council to the Society at the General Meeting of the 21st January, 1868.

THE Council have to make the following Report to the Members of the Society on the occasion of their present Annual Meeting.

They have to commence, as usual, with a summary of the state of the Subscription list; and they regret to observe that though the number elected during the past twelve months, namely, one hundred and sixteen, is an unusually good average, and though the loss by deaths has been less than usual, yet so great is the number of resignations and removals for non-payment, that the list of paying Members is less by 21 than at the end of 1866. It should, however, be observed that more than one-fifth of those who have resigned are Managers of Tea Gardens, some of which have been closed during the year, and the proprietors of others are obliged to study economy.

The usual classified list is appended.

Classification.	In 30 previous years.	In 1851.	In 1852.	In 1853.	In 1854.	In 1855.	In 1856.	In 1857.	In 1858.	In 1859.	In 1860.	In 1861.	In 1862.	In 1863.	In 1864.	In 1865.	In 1866.	In 1867.	Gross Total.	Total real number at the close of 1867, after deducting lapses.
Honorary Members ...	13	0	1	0	1	0	2	0	0	1	0	0	0	0	0	0	0	0	18	8
Associate Members ...	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	3
Corresponding Members	1	1	1	1	0	0	0	0	1	0	0	1	0	0	2	0	0	1	9	6
Civilians ...	300	22	16	18	6	23	23	17	19	28	23	22	13	12	18	30	18	16	629	188
Merchants and Traders	264	20	12	5	16	18	31	11	20	15	18	17	19	24	17	22	11	21	561	151
Indigo and other tropical agriculturists. .	226	19	13	16	7	14	12	10	14	20	15	15	21	20	20	41	28	24	529	159
Military Officers ...	212	34	18	22	19	26	22	12	14	27	38	26	25	10	21	31	9	19	585	135
Medical Officers ...	97	4	5	3	4	6	9	3	3	16	11	6	7	5	7	14	5	7	212	58
Asiatics ...	99	8	8	8	5	5	7	14	19	4	6	8	3	7	9	8	9	7	234	62
Clergy ...	17	1	1	1	1	2	1	2	0	0	1	0	0	2	0	3	3	1	36	10
Law Officers ..	51	6	3	1	3	6	2	1	5	2	1	2	4	2	3	4	8	4	108	29
Miscellaneous ...	15	6	0	0	10	0	0	2	7	5	5	0	12	9	3	10	16	16	116	65
	1298	122	78	69	72	100	109	72	102	118	123	97	104	91	100	163	108	116	3042	874

N. B.—Of these 874 Members, 208 are resident in Calcutta, 536 in the Country, and 130 in Europe.

The lapses alluded to in the last column comprise 16 deaths,[*] 65 resignations, 24 whose names have been removed for non-payment of subscriptions, and 24 removals from the list in accordance with Section 6 of Chapter 3, of the Bye-laws, their absence from India having exceeded four years, making in all 129.

Of the total number (874) in the foregoing list, 30 are Life Members, 109 are absent from India, 17 are Honorary, Associate, and Corresponding, leaving 718 as the number of paying Members on the books of the Society.

On the important matter of finance the Council have again to reiterate the old complaint of the amount of arrears of subscription being so heavy, notwithstanding continued applications.

The total sum outstanding on the 31st December, after deducting the sum of[†] Rs. 3,277-3-3, considered irrecoverable, is Rs. 11,987-15-3, of which Rs. 1,994 are due from Town Members, and Rs. 9,993-15-3 from Country Members. Of this amount, about Rs. 6,237-12-3 may be considered as readily realizable, but a good proportion of the balance will, it is feared, have to be carried eventually to profit and loss. The Council must again lament this want of punctuality on the part of some distant Members in payment of their dues; and they would again, in the words of their last Report, urge this fact upon those who, while desirous of availing themselves of their privileges, apparently forget their pecuniary obligations to the Society.

The Council submit at the end of their Report the usual statement of Receipts and Disbursements, vested Fund, arrears of Subscriptions and Liabilities. The total receipts during the year amount to Rs. 32,312-4-1, adding to which the balance in hand at the close of 1866, *viz.*, Rs. 1,595-6-1, shews the total of receipts as per statement, Rs. 33,907-10-2. The disbursements during the year amount to a total of Rs. 33,047-0-3, which, deducted from the receipts, leaves the balance of cash in the Bank of Bengal, and with the Secretary on 31st December, Rs. 860-9-11. The Vested Fund remains the same, namely,

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[*] Messrs. R. Mills, Hunt Marriot, A. Pigou, C. S., T. W. Payne, G. R. Barry, J. S. Shillingford, George Meares, H. Monckton, C. S., the Hon'ble Sumbhoo Nath Pundit, Dr. David Scott, Baboos Puddo Lochun Mundul and Gobind Chunder Sein, Messrs. J. Siddall, R. Berkeley, T. J. Maltby, and Adam George.

[†] This amount is made up partly of arrears of subscription, of which the recovery is hopeless; party of subscriptions debited to Members after they had left India, and which consequently, they are not called on to pay; and partly for subscriptions due by others whose residence cannot be traced.

Rs. 16,633-5-3. The liabilities of the Society amount to Rs. 12,500 for seeds obtained from England, France, North America, and Australia; to meet this there is the amount due for arrears of subscription, for seeds, grafts, &c., and the cash balance, which form a total of Rs. 14,222-4-9.

The importation of seeds during the past year has been on the usual scale. The Council regret to record that so many complaints have been received in respect to the vegetable and flower seeds supplied by Messrs. James Carter and Co. that they have been reluctantly compelled to order the larger portion for next season from Messrs. Vilmorin, Andrieux and Co., of Paris. This firm sent, on the requisition of the Society, one hundred packets of flower seeds in November last, which have germinated most readily in various parts of the country. The Council do not wish to infer from the failures complained of, that Messrs. Carter & Co. have sent seeds of an old or inferior description; indeed the report which Dr. Hooker gave of trials made in the Gardens at Kew, tend to prove that they were fresh when despatched; but as they have been so unfavorably reported on in many quarters, the Council have deemed it necessary, in the interests of the Society, to make this change. It seems possible that as the seeds are ripened in France under more favorable circumstances than in the uncertain climate of England, they are better able to stand the test of a long sea voyage, and consequently germinate more readily.

The consignments from North America and Australia have afforded general satisfaction. The East Indian Railway Co., and the Inspector General of Jails, Lower Provinces, have availed themselves of the agency of the Society in obtaining large supplies of vegetable seeds; the former for distribution to their employès at various stations, and the latter for the Jail gardens throughout Bengal.

The Annual Horticultural Exhibition was held in the Sailors' playground on the 26th January. The display of vegetables was as good as in previous years, but the show of flowers was not equal to the average. Rs. 580 were awarded in prizes.

The unsuccessful efforts made by the Society to obtain ground in an eligible situation for the purposes of a garden, in lieu of that hitherto occupied in the Botanic Garden, were dwelt on in the last

Report. The Council have been recently moving again, in conjunction with a Committee of Members of the Asiatic Society, who are desirous of establishing a Zoological Garden, and a conjoint Committee have addressed the Government of Bengal on the subject, pointing out more especially a portion of the unoccupied grounds belonging to the Kidderpore Military Orphan Asylum, as a suitable site. No definite reply has as yet been received. The Council have also been in further correspondence with the Government of Bengal in respect to a claim for reimbursement for the permanent improvements effected on the land in the Botanical Gardens, which they are surrendering. The Government of India have authorized the payment of the sum of Rs 6,068, as compensation for such improvements, based on an estimate submitted by the Superintendent of the Botanic Gardens: but the Council, conceiving this amount to be a very inadequate compensation, have applied for a larger sum (Rs. 12,000), which, they are of opinion, founded on a valuation-report of Messrs. Burn & Co., is a fair price for permanent improvements, as they now stand. They hope to be able to announce in their next Report that this application has been acceded to.

Scarcely had the portion of the ground which the Society still have in possession recovered from the effects of the severe gale of the 5th of October 1864, when it was visited with another of the 1st November last, which, though it has not done so much damage as its predecessor, has caused considerable loss in the shape of property and plants, and has rendered it necessary to cease the delivery of plants temporarily. Notwithstanding this disaster, the distribution during the first ten months of the year has exceeded that of 1866, being 13,789 against 11,671, besides cuttings of many kinds. This number might have been exceeded by at least one-fourth, had the supply been equal to the demand. The number of applications have been 160. In the above mentioned number is comprised 2,117 fruit grafts, 11,067 ornamental plants, (including rather more than 2,000 roses) and 605 orchids. Several Wardian cases have also been issued. No useful plants, such as sugarcane tapioca, ginger, guinea grass, arrowroot, rheea, &c., have been given out, in consequence of that portion of the ground, known as the economic garden, having been entirely surrendered to the Royal Botanic Garden. Nor have the Society had the means of testing, by experimental crops, the various samples of Carolina rice, exotic cotton, and other agricultural seeds which they have received, or imported, as in former years.

A new feature in the operations of the Society has been the exhibition of rare or well-grown plants at the Ordinary Meetings, and the assignment to exhibitors of marks, on the plan observed at similar exhibitions in London. The report on the subject from a Special Committee of the Council was adopted at the March Meeting, and has been favorably responded to by the submission, at the April and following Meetings, of fair collections of plants from several Members. The Cyclone above adverted to, has caused a cessation of the practice for two months, but the Council trust that it will be renewed next year and that the collection will increase in number and variety.

The introduction of "Notes and Queries" into the Proceedings of the Society will, it is believed, tend to elicit a considerable body of useful information from various parts of the country, and to call attention to papers already published in the Journal. The Council hope that these communications will be continued.

Already some interesting facts have been recorded on various points, more especially on horticultural subjects, and in connection with the cultivation of the Arabian date palm in India.

Allusion was made in the last Report to the successful re-introduction of Carolina paddy into Bengal, and to the steps taken to meet a growing demand for it. Through the kindness of the Government of Netherland, India, the Society received a small quantity (seven maunds) of *acclimated* seed from Java, in July, which, though late in the season, was immediately distributed. To the good offices of Dr. Forbes Watson, of the East India Museum, we are indebted for a larger supply (about 30 maunds) of *imported* seed, which having reached too late in the season, has been retained for distribution at the proper period next year. Small parcels of *acclimated* seed have also been received from the Madras A. & H. Society, but so great is the demand for it in that Presidency, that a small quantity only could be furnished.

The question of promoting the spread of agricultural knowledge in Bengal, introduced in a communication from Mr. John Stalkartt, to the Government of Bengal, and referred by the Lieutenant-Governor to the Society for report, has been occupying attention during the past year. The report of a Speical Committee was submitted at the September Meeting, and forwarded to Government with the Council's recommendation for the carrying out of the Committee's suggestion on a small scale. They expressed at the same time their opinion that, to ensure anything like success, the cordial co-operation of the landholders, European and Native, is absolutely necessary.

The result of the Circular issued for information as to the average yield of Tea per acre in the principal Tea districts of India, was alluded to in the last Report. Encouraged by the amount of information obtained, the Council have, at the suggestion of the President, issued another Circular during the past year, with the view of eliciting similar information regarding the yield of Rice throughout the country. The Circular also embraces questions on all subjects connected with the cultivation of this most important staple; and if heartily responded to, the Council will be in possession of a mass of most useful information for publication in the Journal.

Among other subjects which have engaged the attention of the Society during the past year, the Council would desire to allude to certain communications from Lieut. Pogson, Mr. Forsyth, Commissioner of the Jullundur Division, Drs. H. Cleghorn and J. L. Stewart, respecting *Chenopodium Quinoa* and its introduction, as proposed by Lieut. Pogson, into the Himalayas and the high lands of Thibet. The Society have taken steps to obtain seeds of this plant from South America, with a view of giving it a fair trial.

Many interesting papers connected with Cotton culture, including the reports of Mr. Carnac, the Cotton Commissioner for the Central Provinces and the Berars, have been laid before the Society, as also the result of the sowing of the hybridized seed presented by Major Trevor Clarke. Various papers on the subject of *Rheea* fibre have also been submitted, with notices regarding the resinous products of Bengal, and reports on the failure of silk worms' eggs received from Japan and China.

As all these have been introduced more or less in detail in the Monthly Proceedings, it is unnecessary to dilate on them in this place.

Two Nos. of the Journal, Part 4 of Vol. XIV, and Part 1 Vol. I. (New Series) have been issued during the year. In these are published several interesting papers, including Dr. J. L Stewart's Notes of a Tour in the Punjab Salt Range, with some account of its Flora; and Mr. Samuel Jennings' Remarks on the cultivation of Orchids adapted to the climate of Calcutta.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India, from 1st January to 31st December 1867.

RECEIPTS.

From Members, subscriptions collected during the year				19 896	9	5
,, Government Annual Donation				5.000	0	0
,, Accruings of Interest on Government Securities				665	5	4
,, Proceeds of silk worms eggs	118	8	0			
,, ,, of Carolina Paddy	47	8	0			
,, ,, of Sea Island cotton seed	42	0	0			
,, ,, of fruit grafts from the Nursery Garden	877	7	9			
,, ,, of Australian potatoes .	10	0	0			
,, ,, of a portion of surplus stock of English and American vegetable, and English and French flower seeds, &c.	4,180	15	0			
,, ,, of copies of publications of the Society	62	10	0			
,, Members, amount for glazed cases, pots, packing charges for seeds, &c.	1,014	9	7			
,, Amount repaid for Freight on boxes of seeds forwarded in 1866-67	377	1	0			
,, Sundry receipts by sale of Casks, &c.... ...	19	10	0			
				6,750	5	4
Total Receipts, Rupees				32,312	4	1
,, Balance in the Bank of Bengal on 31st December 1866 .. .	1,505	15	7			
,, Do. in the hands of the Secretary on do. ...	89	6	6			
				1,595	6	1
Grand Total, Rupees				33.907	10	2

DISBURSEMENTS.

By Messrs. James Carter & Co., for seeds supplied in 1865, and in part of 1866	8,275	2	0			
,, Messrs D Landreth & Sons, for seeds supplied in 1865-66, and in part of 1866	4,129	0	6			
,, J C Wilson Esq., for Potatoes from Australia .	200	0	0			
,, Sundry parties for native vegetable seeds .	51	14	6			
,, Messrs. Mosely & Hurst, for 28 seers of Sea Island cotton seed	30	0	0			
				12,686	1	0

LIBRARY.

,, Books purchased for the Library	356	3	9			
,, Binding Books	47	8	0			
				403	11	9

PRINTING.

,, Sundry parties for printing Receipts, Letters of Call, Rice Circular, and Circular of Monthly Exhibition of rare plants				79	4	0

JOURNAL.

,, Bishop's College Press, for printing, &c., 700 copies of Journal, Parts 3 and 4, Vol. XIV ..	848	12	3			
,, City Press, for printing 700 copies of Monthly Proceedings, from July 1866 to June 1867 ..	167	1	0			
,, Mr. W B. Nyss for certain plates for Vol. XIV, Part 4	180	0	0			
				1,195	13	3
Carried over ...				14,364	14	0

Brought forward ...				14,364	14	0
MEDAL.						
By Colonel Ballard, Mint Master, for silver used for a "Grant Medal," &c.				16	9	9
NURSERY GARDEN.						
" ordinary expenses incurred on account of the Nursery Garden, from 1st December 1866 to 30th November 1867	3,738	1	9			
" Extra expenses incurred for purchase of fruit seedlings for grafting, for glazed cases and pots	720	15	6			
" C. K. Hudson, Esq., for 19 baskets of orchids from Cherra Poonjee, ..	95	0	0			
" S. Jennings, Esq., for 25 baskets of Orchids and Vanda Cerulea	66	0	0			
" Howrah Municipality for assessment on Society's Garden from May 1866 to June 1867	193	12	0			
" Messrs. James Powel & Sons for bell-glasses supplied in 1866	78	0	9			
				4,891	14	0
ESTABLISHMENT.						
" Amount for Establishment, from 1st December 1866 to 30th November 1867	...			9,155	4	9
ADVERTISEMENT						
" Advertising notices of General Meetings of Shows of Vegetables and Flowers, distribution of Seeds, &c.	...			169	8	6
FREIGHT.						
" Freight on boxes of Seeds, Books, &c., sent and received from America, England and Melbourne	...			866	7	3
PECUNIARY REWARDS.						
" Prizes to mallees for Vegetables and Fruits at Exhibition held on 26th January 1867 ..	323	0	0			
" Ditto ditto for Flowers at ditto on 26th January 1867	257	0	0			
				580	0	0
FURNITURE.						
" Sundry articles of Furniture	...			10	11	0
METCALFE HALL.						
" Society's proportion of Assessment, from October 1866 to September 1867	360	0	0			
" Do. do. for Lighting and Police, from October 1866 to September 1867 ...	126	0	0			
" Messrs. Burn & Co., in full, for repairs in 1865 to north portico	1,000	0	0			
" Ramjan Mistry, for repairing roof	25	0	0			
				1,511	0	0
STATIONERY.						
" Stationery for Office Books, &c.	76	12	0			
" Brown packing Paper for packing seeds... ..	46	0	0			
				122	12	0
SILK WORMS EGGS.						
" Messrs. Apcar & Co., for a box of Japanese Silk-worm Eggs	...			108	7	3
Carried over ...				31,797	8	6

Brought forward ...				31,797	8	6

PETTY CHARGES.

By Sundry charges, incluiding Postage on letters, &c., sent and received, and for copies of the Journal ...	720	2	10			
,, Extra Writers and Packermen for sub-dividing and writing on seed papers, &c., for soldering tin boxes, for boxes sent to non-resident Members, and for other petty charges ...	264	6	3			
,, Sundry parties for pitching tents, and breakfast, for Exhibition of Vegetables and Flowers on 26th January 1867 ...	230	1	0			
,, Secretary Bank of Bengal, for Commission for drawing Interest on Government Securities .	1	10	8			
,, Messrs. Grindlay & Co., balance of their account dated 1st January 1867	17	3	0			
,, Refund of Subscription	16	0	0	1,249	7	9
				33,047	0	3
Balance in the Bank of Bengal on 31st December 1867	766	6	3			
Ditto in the hands of the Secretary on ditto ...	94	3	8	860	9	11
Grand Total, Rupees				33,907	10	2

MEMORANDUM.

DISBURSEMENTS.

	Rs.	A.	P.	Rs.	A.	P.
To Amount of Disbursements during the year 1867, as per statement				33,047	0	3
„ Balance in the Bank of Bengal on 31st December 1867	766	6	3			
„ Ditto in the hands of the Secretary on 31st December 1867	94	3	8			
				860	9	11
Total, Rs.				33,907	10	2

RECEIPTS.

	Rs.	A.	P.	Rs.	A.	P.
By amount of Receipts during the year 1867, as per Statement				32,312	4	1
„ Balance in the Bank of Bengal on 31st December, 1866 ..	1,505	15	7			
„ Do in the hands of the Secretary on 31st December 1866, ...	89	6	6			
				1,595	6	1
Total, Rupees ...				33,907	10	2

LIABILITIES.

	Rs.	A.	P.	Rs.	A.	P.
Bishop's College Press for printing Part 1, vol. 1	444	0	0			
French flower seeds (V. A. & Co.) £48, say	500	0	0			
Carolina paddy £43-13-8, say ...	450	0	0			
English vegetable and flower seeds balance of 1866, £217-10-5						
Ditto for 1867 £594-6-4						
£811-16-9	8,200	0	0			
American vegetable seeds for 1867 £1,420, say	2,850	0	0			
Agricultural seeds from Melbourne £47-4-5, say	500	0	0			
				12 944	0	0

DEPENDENCIES.

	Rs.	A.	P.	Rs.	A.	P.
Amount invested in Government Securities lodged in the Bank of Bengal				16,633	5	3
Ditto of Subscriptions in arrear ..	11,987	15	3			
Ditto outstandings for Seeds, Grafts, copies of Journal, &c., &c., ...	2,234	5	6			
				14,222	4	9

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31*st*, 1867.

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

Office Bearers.

President.

ARTHUR GROTE ESQ.

Vice-Presidents:

W. STALKARTT, ESQ.	S. H. ROBINSON, ESQ.
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BABOO PEARY CHAND MITTRA.
S. P. GRIFFITHS, ESQ.
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HON'BLE J. P. NORMAN.
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ROY HURO CHUNDER GHOSE BAHADOOR.

Patron:

HIS EXCELLENCY THE RIGHT HON'BLE SIR JOHN
LAWRENCE, BART.

List of Members.

* This Mark denotes Members who have compounded for their Annual Subscriptions.

† This Mark denotes Members who are absent from India, and therefore Non-contributors.

‡ This Mark denotes Members who, though absent, are desirous of continuing their Subscriptions

HONORARY MEMBERS.

The Right Honorable Sir Edward Ryan, A. M., F. A. S., London,	1828	1841
Colonel John Colvin, C. B., London,		1830
J. Mackay, Esq.,		
Don Ramon de la Sagra, Island of Cuba,		
Dr. Justus Leibig, Professor of Chemistry in the University of Giessen,		1843
The Right Honorable Sir Lawrence Peel, London,	1842	1856
R. Fortune, Esq,		1856
Sir Arthur Buller,	1849	1859

CORRESPONDING MEMBERS.

D. J. Macgowan, Esq., M. D. Ningpo,	1851
Mons. Natalis Rondot, Paris,	1858
Capt. Thos Hutton, F. G. S. Mussoorie,	1861
Lt.-Coll. W. H. Lowther, Berhampore,	1864
James Cowell Esq., London,	1864
Dr. H. Cleghorn, Edinburgh,	1867

ASSOCIATE MEMBERS.

Mr. R. Scott, late Head-Gardener, Royal Botanic Garden, Calcutta, (London,)	1851
Capt. E. P. Nisbet, London,	1842
Mr. John Scott, Head Gardener, Royal Botanic Garden, Calcutta,	1866

ORDINARY MEMBERS.

	Admitted.
ABBOTT, Horace Esq., Rajahpore viá Koosteah,	1858
Abbott, Lieut. Colonel J. R. Calcutta,	1865
Abdool Gunny, Kajee, Zemindar, Dacca,	1860
Achard,† Lewis Frederick, Esq., Merchant,	1862
Ackland,† C. J. Esq., Merchant,	1855
Adams, J. H. Esq., Tea-planter, Seebsaugor, Assam,	1867
Ady, Charles Esq., Merchant, Moulmein,	1864
Agabeg, J. Esq., Merchant, Calcutta,	1858
Agabeg, A. L. Esq., Merchant, Calcutta,	1860
Agabeg, Malchus, Esq., Advocate, Rangoon,	1866
Ainslie, W. Esq., Civil service, Patna,	1847
Alexander, E. J. Esq., Civil service, Bhaugulpore,	1862
Alexander, R. Esq., Civil service, Cuttack,	1864
Alexander, N. Stuart, Esq., C. S. Purneah,	1864
Alexander, W. Esq., Merchant, Calcutta,	1865
Alexander, Major W. R. E., Commanding 1st Bengal Cavalry, Nowgong, Bundelkund,	1867
Alexander, Capt. F. J., Invalid Establishment, Mussooree,	1867
Allen, Thomas, Tayler, Esq., Civil service, Tipperah,	1866
Allowallea,* Rajah of Kapoorthullea, Jullunder,	1853
Ameer, Hassain Khan Mahomed, Rajah of Mahmoodabad, Seetapore District, Oude,	1867
Amesbury, Dr. W. R. 1st Bengal Cavalry, Nowgong, Bundelkund,	1865
Anderson,† P. Esq., Merchant,	1854
Anderson, Thomas, Esq., M. D., F. L. S. Superintendent Royal Botanic Garden, Calcutta,	1861
Anderson, Lt. Col. W. W., (1st Bombay Lancers) Supt. H. H., the Guicowar's Contingent of Horse, Manickwama, Kattywar,	1859
Anderson, Dr. J. Curator Impl. Museum, Calcutta,	1865
Angelo,† Elliot, Esq., Merchant,	1859
Anstruther, Hamilton, Esq., Merchant, Calcutta,	1867
Apcar,† Thomas, Esq.,	1861
Armstrong, C. M. Esq., Opium Dept., Gazeepore,	1858
Armstrong,† J. W. Esq., Supg. Engineer,	1862
Armstrong, J. S. Esq., C. S. Cuttack,	1865
Ashburner, Major John, (Bombay Staff-corps) Depy. Commissioner, Chindwarah,	1864
Ashworth,† W. A. Esq.,	1865
Atkinson, W. S. Esq., Director Public Instruction, Calcutta,	1864
Atkinson, E. F. T. Esq., Civil service, Jaunpore.	1865
Anley, George Esq., Civil Engineer, Calcutta,	1861
Auchidzky, P. Esq., Merchant, Akyab,	1864
Augier, P. Esq., Calcutta Mint,	1858

	Admitted.
Austen, Capt. Godwin, Survey Dept., Surwai viâ Sylhet,	1867
BADGER, A. Esq., Manager Equitable Coal Company's Colliery, Choukeedwgah Ranneegunge,	1866
Bainbridge, Herbert Esq., Tea-planter, Gowhatty, Assam,	1862
Bainbridge, Reginald, Esq., Tea Planter, Gowhatti	1867
Baird, Major A. F. Executive Engineer, Hazareebaugh,	1861
Baker, Thomas Esq., Anjooree Tea plantation, Jorehaut,	1864
Balfour,† G. G., Esq,	1844
Balfour,† Lewis, Esq., Merchant,	1842
Balfour, H. Esq., C. S. Burrisaul,	1865
Barlow,‡ G. N. Esq, Civil service,	1864
Barnes, H. B. Esq., Superintending Engineer, P. and O. Co's. Service, Garden Reach,	1866
Barrow,† T. Esq, Solicitor,	1866
Barry,† Dr. J. B.,	1856
Bartlett, Major H. T. Bengal Staff Corps, Saugor,	1865
Baugh, Lt. Col. F. W. Conservator of Forests, Almora,	1855
Baumgarten, F. Esq., Hulda Valley Estate, Chittagong,	1865
Bayley, E. C. Esq, Civil service, Calcutta,	1863
Bayley, Stuart Colvin Esq, Civil service, Calcutta,	1859
Beadon,† Sir C.,	1855
Beadon, Henry, Esq, Civil Service, Kooshtea,	1867
Beaufort, Francis L. Esq, Civil service, Calcutta,	1838
Becher, William, Esq., Gowhatti,	1855
Becher, J. M. Esq., Indigo-planter, Tewalah factory viâ Durbangah, Tirhoot,	1862
Beeby, G. O. Esq., Solicitor, Calcutta,	1866
Begg,‡ Dr. D.,	1850
Bell, J. D.† Esq., Barrister-at-law,	1855
Bell, W. H. Clarke, Esq., Indigo Planter, Coxially, Nuddea	1867
Bell, H. Esq., Civil Service, Nuddea,	1867
Belli, C. H., Esq, Civil service, Rampore Bauleah,	1863
Benson, Major J, C., A. C. G. Rangoon,	1863
Bentall,*† Edward, Esq., Civil service,	1837
Berkeley, L. Esq., Comr. Paper Currency, Calcutta,	1855
Berrill, J. M. Esq., District Supt. of Police, Nursingpore	1866
Betts, C. G. D. Esq., Ourungabad viâ Pakour,	1867
Beveridge, H. Esq., C. S. Hooghly,	1865
Bhowany, Sing,* Maharajah, Duttea,	1864
Bignell, R. A. D'O Esq., Asst-Supt-of Police, Bhuddruck.	1867
Bindabun Chunder Mittra, Baboo, Calcutta,	1853
Birch, Capt. R. G. Fort Adjutant, Fort William, Calcutta,	1867
Bishop,*† Major H. P., (Artillery,)	1853
Blacker, G. M., Esq., Merchant, Calcutta,	1856
Blechynden, R. Esq., Merchant, Calcutta,	1858
Blechynden, A. H. Esq., Secy. Agri-Hort. Socy. of India,	1851

	Admitted.
Boileau, Major Neil; D. J. A. G. Peshawur,	1865
Bonavia, E. Esq., M. D., Assist. Surgeon, Lucknow,	1859
Bond, F., Esq., Executive Engineer, Cuttack	1867
Booth, Dr. B S Mozufferpore, Tirhoot,	1867
Boulderson, A. Esq., Civil service, Budaon.	1865
Bourne, Walter, Esq., Resident Engineer, E. I. Railway, Assensole viâ Raneegunge,	1855
Bowser, H. C. Esq., Civil Surgeon, Rungpore,	1865
Brae, T., Esq., Dobracole, Commercolly viâ Koosteah	1854
Brandis, Dr. D., Supt. of Forests, Simla,	1857
Brander, James, Esq., E B. Railway, Sealdah,	1865
Brice, N. Esq., Dinapore,	1859
Bridgnell, J. Esq., Accountant, Mint, Calcutta,	1867
Brune, F. B., Esq.,	1863
Brock, Charles Esq., Merchant, Calcutta,	1867
Brodhurst,† M. Esq., Civil service,	1859
Brodie,*† Major T.,	1836
Brooke,† Lieut. Col. John C.,	1843
Broome, Col. Arthur, Royal Artillery, Calcutta,	1864
Broucke, W. J, Esq., Indigo-planter, Loureah Factory, Betteah,	1859
Brougham, Dr. J. P. Presidency Surgeon, Calcutta,	1867
Broughton, Capt. W. E. Delves, 44th N. I. Shillong,	1866
Broughton, E. Esq, Merchant, Calcutta,	1865
Brown, H. F. Esq., Merchant, Calcutta,	1867
Browne, Lord Ulick, Civil Service, Chittagong,	1867
Browne,† J. F. Esq.,	1862
Browne, Rev. J. Cave, Kidderpore,	1866
Brown, Forbes Scott, Esq., Merchant, Penang,	1840
Brown, Lieut. Col. D., 1st Madras Fusiliers, Assist.-Commissioner, Moulmein,	1856
Browning, Fred. R. Esq., Civil Engineer, Jamtarrah, Assensole,	1867
Bruce, Lt. and Adjutant, E. 37th Madras Grenadiers, Cuttack,	1866
Bruckner,† A., Esq., Merchant,	1860
Brundell,† R. S., Esq., Resident Engineer E. I. Railway,	1862
Buchanan, George, Esq., Merchant, Moulmein,	1862
Buckingham, J. Esq., Tea-planter Jorehaut, Assam,	1867
Bullen,† John, N. Esq.,	1859
Buller,*† Frederick Pole, Esq., Civil service,	1837
Burbank, Capt. C., Emigration Agent, Calcutta,	1863
Burgett, C. F., Esq., Merchant, Calcutta,	1863
Burnell, Lieut. J., Executive Commissariat Officer, Hazareebaugh,	1862
Burrows,† Henry, Esq,	1860
Buskin, E. G., Esq., Calcutta,	1864
Butt, Geo. Esq., Civil service, Moradabad,	1860

	Admitted
CAMERON, Dr. J. McLeod, Civil Surgeon, Monghyr,	1865
Campbell, Alexr. S. Esq., Managing Proprietor, Western Assam Company, Luckimpore,	1863
Campbell,† W. F., Esq.,	1838
Campbell,*† Archibald, Esq., M. D.,	1838
Campbell, John Colin, Esq., Calcutta,	1864
Campbell, Archd. Esq., Asst. Commr. Gowhatti,	1861
Campbell, John Macdonald, Esq., Tea-Planter, Dyapore Concern, Cachar,	1864
Campbell,† Honble. Geo., Civil Service,	1865
Carbery, R. J., Esq., Indigo-planter, Bolrampore, Lucknow,	1865
Carew,* R. R. Esq ,	1846
Carnac, C. F., Esq., Civil Service, Ghazeepore,	1865
Carnegy, P., Esq., Assist.-Commissioner, Fyzabad,	1857
Carrick,† Henry Esq., Locomotive Supt. E. B. Railway.	1863
Castle, C. T., Esq , Supt. of Police, Banda,	1865
Cave, H. S., Esq., Indigo-Planter, Purneah.	1852
Cavenagh,† Lieut.-Colonel, O., Governor of the Straits Settlements,	1848
Chamberlain, Major Chas. 1st Bengal Cavalry, Nowgong, Bundelkund,	1859
Chardon, W. B. Esq., Doudnaggur, Shahabad,	1864
Chalmers, Capt. S., Depy. Asst. Comy. Genl., Cawnpore,	1865
Chapman, R. Esq., Merchant. Umritsur,	1867
Cheke, J. M. G. Esq., Bancoorah,	1860
Chrestien, T., Esq , Banally, Raneegunge,	1864
Chunder Kaunt Mookerjee, Baboo, Calcutta.	1866
Clark, Dr. Stewart, Inspector Genl. of Prisons, N. W. P., Allahabad,	1855
Clarke, G. R., Esq., Indigo-planter, Moisrakha,	1855
Clarke,† Capt Harvey M. Stanley, Supt. of Police,	1865
Clarke,† R. J. Esq., Executive Engineer,	1867
Clerk, Lieut. Malcolm G , Asst. Engr., Kussowlee, Punjab,	1858
Cockburn,† W. Esq.,	1846
Cockburn, Wm., Esq., Indigo-planter. Doomra, Tirhoot,	1861
Cockburn, Jas. Esq , Bengal Police, Purneah,	1865
Cockburn, J. F. Esq., Kanoo Junction, Burdwan,	1866
Cockerell,† Capt J.,	1860
Cockerell, Horace Esq., Civil service, Mozufferpore, Tirhoot,	1861
Cogswell, W. H. Esq., Calcutta,	1866
Cole, Rev. J., Supt. Lawrence Asylum, Sanawur,	1865
Collector of Mynpooree,	1867
Collins, W. B. Esq., Assistant to the Fort Adjutant, Fort William,	1863
Collis,† S. E., Esq , Solicitor,	1859
Colvile,*† Sir. J. W.,	1849
Colvin,† J. C. Esq., Civil service,	1861

	Admitted.
Commandant Deolee Irregular Force, Deolee *via* Jeypore,	1865
Commanding Officer—19th Hussars, Meerut,	1854
Cook, F. C. Esq., Bhaugulpore *via* Azimghur and Toortiepore,	1866
Cope, Henry, Esq., Merchant, Umritsur,	1847
Corbyn, the Rev. H., Campbelpore,	1865
Cornell, W., Esq., Civil service, Calcutta,	1861
Cosserat,† P., Esq.,	1857
Cosserat, Lewis Esq., Indigo-planter, Burhogah *via* Sewan,	1859
Cosserat, A. W., Esq., Depy. Magt. Berhampore,	1865
Courjon,‡ Alfred, Esq., Zemindar, Chandernagore,	1863
Courtney,† J. M., Esq., Banker,	1865
Cowley, F. W. R. Esq., Civil service, Hajeepore, Tirhoot,	1867
Craster, E. C., Esq., Civil service, Bhaugulpore,	1858
Crawford, J. A., Esq., Civil service, Calcutta, (*Vice-President,*)	1857
Creswell, C. E., Esq., Merchant, Calcutta,	1855
Crommelin, C. R. Esq., Roy Bareilly,	1860
Crommelin, Lieut.-Col. J. A., Darjeeling,	1857
Crooke, Henry, Esq., Merchant, Calcutta,	1858
Crosthwaite, C. H. T. Esq., C. S. Etah,	1865
Cumberlege, Major Genl. E. A., Mussooree,	1866
Cumming, William, Esq., Indigo-planter, Rajmehal,	1851
Currie, Charles Esq., Civil service, Jaunpore,	1855
Currie, Capt. O. H., 19th Hussars, Meerut,	1865
Curtis, J. F., Esq., Indigo-planter, Ramcollah, Chuprah,	1860
DACOSTA, Joseph, Esq., Pleader, Civil Court, Bhaugulpore,	1865
Dalton, Lt.-Col. E. T., Commissioner of Chota Nagpore,	1848
Daly, F. D. Esq., Manager Simla Bank, Umballah,	1867
Daniell, E. C., Esq., Calcutta,	1865
Dashwood, H. W. Esq., Civil service, Agra,	1860
Daunt, W. Esq., Dehree,	1857
Davies, Major J. S. Judicial-Commissioner, Chota Nagpore,	1857
Dear, Herschel, Esq., Monghyr,	1860
Deare, W. G. Esq., Deputy-Magistrate, Nurral,	1865
Degumber Mittra, Baboo, Calcutta,	1866
Dejender Nauth Tagore, Baboo, Calcutta,	1863
Delane, Major G., Commanding G. G's. Body Guard, Dehra,	1864
Delauney, J. P. Esq., Indigo-planter, Commillah,	1862
Deputy Commissioner of Raepore (Central Provinces,)	1865
Deputy Commissioner of Sumbulpore,	1866
DeSaran, Eugene Dubois, Esq., Culna,	1858
Deveria, J. Esq., Zemindary Manager Bengal Coal Company, Raneegunge,	1866
Deverell, H. Esq., Indigo-planter, Ackrigung Factory, *via* Berhampore,	1854

	Admitted.
Dhunjeebhoy, Byramjee Mettia, Mr., Merchant, Calcutta,	1867
Dias, T. C. Esq., Advocate, Moulmein,	1866
Dickens, Lt.-Col. C. H., Artillery, Secy. Govt. of India, P. W. D.,	1856
Dickson, G. Esq., Secy. and Treasurer Bank of Bengal, Calcutta,	1863
Dinwiddie, Dr. Joseph, Civil Surgeon, Shillong and Cosya,	1867
Dixon, Wm., Albert, Esq., Soonarie Factory, Seebsaugor,	1867
Dodgson, W. Esq., Kallygunge Factory, Rungpore,	1864
Dombal, M. E. Durup de, Esq., Nathpore, *viâ* Dacca,	1860
Doorgapersaud, Baboo, Zemindar, Etah,	1864
Doveton, H., Esq., Deputy Magistrate, Mozufferpore, Tirhoot,	1855
Dowson, George E. L. Esq., Advocate and Notary, Moulmein,	1867
Doyne, Richard, Esq., Barrister-at-law, Calcutta,	1855
Drew,† Lt.-Col. H. R.,	1860
Drummond, E. Esq., Civil service, Patna,	1866
Drury,†-Lt. Col. C. C., Police Dept.	1860
Ducas, C. Esq., Civil Engineer, Burrakur,	1867
Duff, W. P. Esq., Merchant, Calcutta,	1867
Dunlop,† H. G., Esq.,	1863
Dunne, A. D., Esq., Indigo-planter, Mymensing,	1862
Eames, R. Esq., Merchant, Debrooghur,	1855
Earle,† Dr. F. J. Civil Surgeon,	1859
Eddis,† W. U. Esq., Merchant,	1858
Eddy, H. C., Esq., Manager Deohull Tea-Gardens, Debrooghur,	1865
Edwards, Anthony, Esq., Mooteeharee, Champarun,	1866
Egerton, R. E., Esq., C. S. Nagpore,	1864
Eldridge, F. G. Esq., Merchant, Calcutta,	1867
Eliot, Col. John, Artillery, Meean Meer, Punjab,	1839
Elliot, A. J. Esq., Civil service, Arrah,	1865
Elton, Dr. H. N , Sealkote,	1865
Elwyn, Major, W., Cantonment Magistrate, Peshawur,	1862
Erskine H. C. Esq., Indigo-planter, Elambazar, Soorool,	1855
Eshanchunder Bose, Baboo, Merchant, Calcutta,	1848
Eshan, Chunder Sircar, Baboo, C. E. Calcutta,	1867
Ewing, R. L., Esq., Indigo-planter, Belowhee, Kultea, Shahabad,	1863
Fagan, G. S., Esq., Barrister Supreme Court, Calcutta,	1855
Fairley, W. C., Esq., Merchant, Chittagong,	1866
Falcon,† A. B., Esq., Civil Service,	1858
Farquharson, D. Esq., Banalee, Raneegunge,	1866
Fenwick, Captain, G. R., Calcutta,	1865

	Admitted.
Fergusson, Hugh, D. Esq., Indigo-planter, Allyghur,	1867
Ferris, Dr G. R., Calcutta,	1865
Finch,† J., Esq, Indigo-planter,	1863
Firminger, Rev. T. A. C., Gowhatti,	1851
Fisher, Capt. G. B., District Supt. of Police, Tipperah,	1865
Fitzgerald, Capt. O., Tea-planter, Byjnauth, Kangra,	1866
Fitzpatrick, W. Esq., Monghyr,	1860
Fitzpatrick, Dr. A., Calcutta,	1866
Forbes, Capt. H. T., Kishnaghur,	1856
Forlong, James Esq., Durbungah,	1850
Forster, Major, F. B., 5 Fusiliers, Ferozepore,	1867
Fowle, Capt. E., Secy. A. and H. Society, Rangoon,	1864
Fox, Dr. H. E., Civil Surgeon, Jaunpore,	1866
Foy, Arthur Esq, Fuzulnugur *viâ* Lukeempore, Oude,	1866
Fraser, W. T. Esq., Bank of Bengal, Cawnpore,	1867
Freeman, H Esq., Lall Serriah Factory, Seegowly, Champarun,	1866
French, Henry G., Esq., Calcutta,	1839
French, E. L. Esq., Tea-planter, Jorehaut, Upper Assam,	1864
Fressanges, J. S. Esq., Merchant, Cuttack,	1860
Fytche, Col. A., Commr. British Burmah, Rangoon,	1849
Gair, Alexander Esq., Merchant, Rangoon,	1867
Galiffe, J. F. Esq., Collector of Canal Tolls, Calcutta,	1856
Garnaut,† Lt H. W., Executive Engineer,	1859
Garrett, C B. Esq., Civil service, Arrah,	1860
Garstin, Genl. Edward, (Engineers,) Outacamund,	1834
Gash, J. D. Esq., Indigo-planter, Horrowah Factory, Benares,	1867
Gaussen, Lt.-Col. D., Dehra-Doon,	1861
Gibbon, T M Esq., Indigo-planter, Turcooleah Factory, Tirhoot,	1860
Girardot, F. G. Esq., Telwaree Tea-plantation, Gwaldum, near Almorah,	1866
Glascott, Geo. A. Esq., Indigo-planter, Laucknutpore, Kishnaghur,	1866
Glass, J. Esq., Asst. Engineer, Dumagudiem, Upper Godavery, C. S.	1866
Goad, G. S. Esq. Manager Assam Company's Dhubba Division, Nazeerah *via* Seebsaugor, Upper Assam,	1866
Goode,† Lieut.-Coll. Madras Army,	1865
Goodenough,† F. A., Esq., Merchant,	1863
Gopal Laul Tagore, Baboo, Merchant, Calcutta,	1850
Gordon,† D. T., Esq., Manager Silk Filatures.	1859
Gordon, John Esq., Rangoon,	1865
Gouldhawke, J. Esq., Caragola,	1851
Gowan, Major J. Y., Bengal Staff Corps, 2nd in Command, 33rd Regt. N. I., Morar, Gwaliar,	1865

	Admitted.
Grace, Geo. Esq., Sylcooree, Cachar,	1865
Graham,† Joseph Esq., Barrister-at-law,	1858
Graham, W. F. Esq., Indigo-planter, Colgong,	1862
Grant, Thomas Esq , Indigo-planter, Bhagulpore,	1848
Grant, G. H. Esq., Indigo-planter, Bhagulpore,	1859
Grant, John Peter Esq., Junr. Civil service, Bancoorah,	1860
Grant,† T. R., Esq., Merchant,	1863
Grant, C. Esq., Darjeeling,	1864
Granville, Walter L. B., Esq., C. E., Consulting Architect, Govt. of India, Calcutta,	1866
Gray, J. J. Esq., Indigo-planter, Malda,	1846
Green, Randle E. Esq,, Merchant, Calcutta,	1866
Greenhill,† F. Esq., V. S.,	1865
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Secretary Public Garden, Monghyr,	1853
Secretary Agri. and Hort. Society, Saugor,	1863
Secretary Agri. and Hort. Society, Bhaugulpore,	1864
Secretary Cantonment Public Garden, Agra,	1865
Secretary Local Fund Committee, Goorgaon,	1865
Secretary Assam Company, Calcutta,	1865
Secretary Public Garden, Jaloun, Oorai,	1866
Secretary Govt. Garden, Muttra,	1866
Secretary Local Committee, Chindwarrah,	1867
Secretary Local Committee, Jahnsie,	1867
Secy. Road Fund Committee, Jaunpore.	1867
Seton-Karr, Honble., W. S. Civil service, Calcutta,	1859
Seymour,† S. F. Esq ,	1853
Shaw, D. T. Esq., Merchant, Calcutta,	1865
Sheanundun Sing Rajah, Shohur District, Chuprah,	1863
Shearin, E. Esq , Merchant, Calcutta,	1856
Sheridan, A. J. R. Esq., M. D , Soory,	1860
Sherriff, W. Esq., Jorrada, Jessore,	1859
Sheodial-Sing,* H. H. Mohakhan, Rajah of Alwar,	1863
Shewell, Lieut. A. M., Commissariat Dept., Nusseerabad	1867
Shib Chunder Sircar, Zemindar, Kirin-nahar, Thanah Shacoolipore, District Beerhoom,	1865
Shillingford G. W. Esq., Kolasay Factory, Purneah,	1867
Shore,† R. N. Esq., Civil service,	1865
Shortt, T. H. H. Esq., Civil service, Midnapore,	1866
Showers, Lt Col. C. L , Agra,	1863

	Admitted
Simons, C. J. Esq , Tea-planter, Nazeera, Assam,	1863
Simpson, B. Esq., Civil Surgeon, Darjeeling,	1863
Simpson,† James Esq., Civil service,	1856
Simpson, D. Esq., Civil service, Lahore,	1854
Skene,† Capt. J. G., H. M's 77th Regiment,	1862
Skinner, A. Esq., Hansi,	1854
Skipton, D. P. Esq., Tea-planter, Golaghat, Assam,	1865
Sladen, Joseph Esq., Supt. of the Dehra Dhoon,	1867
Smalley, R. B. Esq., Asst. Supt. Bengal Police, Soory, Beerbhoom,	1867
Smart, Arthur D. Esq., Jorehaut, Assam,	1865
Smeaton, Geo. Esq. Civil service, Jajipore via Balasore,	1867
Smith, J. J. White, Esq , Indigo-planter, Kattulee, Kishnaghur,	1854
Smith,† R. H. Esq., Principal Sudder Ameen,	1860
Smith, Jas. Esq., Shahpore, Tirhoot,	1863
Smith, Thomas T. Esq., Rampoorah Factory, viâ Jeagunge,	1864
Smith,† C. M Esq., Merchant,	1865
Smith, Rev. W O'Brien, Calcutta,	1865
Smith, Rev. James, Delhi,	1866
Smith, Geo. Brown, Esq , Manager, Lacknah Tea Concern, Seebsaugor,	1866
Snead, G. T. Esq , Merchant, Calcutta,	1866
Snow,† Lt. Col. R , Deputy-Commissioner,	1862
Spankie, R. Hon'ble Civil service, Agra,	1865
Spearman, Lt. Horace, Asst Commissioner, Rangoon,	1865
Spencer, C. J. Esq , C E., E. I. Railway, Allahabad,	1863
Stack, R. F Esq.. Solicitor, Calcutta,	1862
Stalkartt, William Esq , Merchant, Calcutta, (*Vice President*)	1845
Stalkartt, J. Esq , Merchant, Calcutta,	1863
Stainforth, H Esq., Ranchee,	1862
Stanton, Capt. F S , (Engineers,) Calcutta,	1857
Steel, Donald Esq., Eastern Cachar Tea Company,	1861
Steel,† Jas Esq , Merchant,	1863
Steer,† Hon'ble Charles, Civil service,	1853
Stephen, J. Esq , Dacca,	1855
Stephenson, Cecil Esq., Agent E. I. Railway, Calcutta,	1866
Sterndale, R. A. Esq., Lahore,	1859
Stevens, R. F. Esq , Manager Hazrapore Concern, Jessore,	1866
Stevens, H. W. Esq., Executive Engineer, Durbangah,	1867
Stevenson,*† William Esq. Junior, M. D.,	1834
Stewart, A. N. Esq., Collector of Tolls, Jungypoor,	1862
Stewart, W. M. Esq., Dulsing Serai, Tirhoot,	1859
Stewart, Captain John, Depy. Com. of Ordnance, Cawnpore,	1860
Stewart, R. D. Esq , Merchant, Calcutta,	1863
Stewart, Dr J. L , Conservator of Forests, Punjab,	1864

	Admitted
Stewart, Capt. F. G., District Supt. of Police, Nagpore,	1865
Stewart, Robert Esq., Merchant, Calcutta,	1867
Stewart, E. Esq., Deputy Magistrate, Mudhypoora, Bhaugulpore,	1867
Stirling, A. Esq., Allipore,	1866
Stokes, Allen Esq., E. I. Railway, Jumalpore,	1867
Stocks, J. W. Esq., Berhampore,	1866
Stoney, R. V. Esq., Civil Engineer, Hidgelee,	1866
Story, Major General F. P., C. B., Nynee-Tal,	1854
Strachey,† Lt. Col. R., (Engineers,)	1857
Stuart, Alex. Esq., Raneegunge,	1863
Strettell, G. W., Esq., Forest Department, Sind,	1867
Sturmer, Edwin Esq., Assistant Engineer, Canning Town, Mutla,	1863
Sturmer, John Esq., Civil Engineer,	1864
Sturmer, A. J. Esq., Talooka Kojha, viá Gazeepore,	1866
Supt. of Jorehaut Tea Company, Assam,	1865
Supt. of the Queen's Gardens, Delhi,	1865
Supt. Northern Assam Tea Company,	1865
Sutherland, Charles J., Esq., Merchant, Calcutta,	1838
Sutherland, Dr. John, Civil Surgeon, Barrackpore,	1859
Sutherland, H. C. Esq., Civil service, Burrisaul,	1860
Suttoshurn Ghosal, Rajah Bahadoor, Calcutta,	1856
Swinden, T. G. Esq., Calcutta.	1855
Swinhoe, William Esq., Attorney, Calcutta,	1859
Syud Ahmed Ally,† Nawab,	1864
TANNER, J. E. Esq., Delhi Railway, Loodianah,	1866
Tarruck Nauth Dutt, Calcutta,	1866
Taylor, G. B. Esq., Mussooree,	1858
Taylor,† V. T. Esq., Civil service,	1860
Taylor, W. C. Esq., Cuttack,	1858
Taylor, Hon'ble G. N., Civil service, Calcutta,	1865
Terry, W. Esq., Indigo-planter, Midnapore,	1846
Thelwall, Major J. B., C. B.,	1851
Thomas, R. M. Esq., Solicitor, Calcutta,	1849
Thomas, J. Esq., Merchant, Calcutta,	1867
Thompson,† Major E., Deputy-Commissioner,	1856
Thompson, Lt. Col. E., Political Agent of Indore,	1864
Thompson,† Rivers Esq., Civil service,	1864
Thompson, Dr. R. F., Hooghly,	1865
Thompson, W. H. Esq., Civil service, Dacca,	1866
Thompson, J. H. Esq., District Supt. of Police, Pooree,	1864
Thomson,† Ninian Esq., Judge S. C. Court,	1862
Thomson, Walter Esq., Merchant, Behea, Shahabad,	1862
Thomson, Wm. Esq., Merchant, Calcutta,	1865
Thorpe, J. Esq., Lucknow,	1867

	Admitted.
Todd, J. E. Esq., Tea-planter, Novcacharee Factory, Jorehaut, Assam,	1862
Tonnerre, Dr. C. Fabre, Health Officer, Calcutta,	1862
Tovey, Captn. J. T., Executive Engineer, Cawnpore,	1866
Trafford,† Rev. John,	1863
Trannath Chatterjee, Baboo, Calcutta,	1865
Tregear, Richd. Esq., Kolinjura, Jaunpore,	1866
Trevor, Edward Tayler Esq, Civil service, Calcutta,	1844
Trevor,† E. A. Esq., Royal Engineers,	1864
Tripe, A. A. Esq., Amoah Factory, Tirhoot,	1864
Troup, C. J. R. Esq., Manager Kamaon and Kattywar Tea Company, Almorah,	1863
Tucker, W. T. Esq., Civil service, Bancoorah,	1855
Tucker, Robert Esq, Tea Planter, Seebsaugor,	1867
Tulloch, Capt. A., Dist. Supt. of Police, Rungpore,	1865
Turnbull, C. S. Esq., Silk Manufacturer, Ghuttal,	1853
Turnbull, J. D. Esq., Civil service, Meerut,	1865
Turnbull, Robert Esq., Merchant, Calcutta,	1865
Twynam, Capt. E. J. L, Executive Officer, Thayet Myo,	1856
Tyler, Dr. J. W, Mynpoore,	1863
Tytler, Col. B. C., Simla,	1867
Veen, W. Ter Esq., Merchant, Calcutta,	1864
Vertannes, J C. Esq., Civil Engineer, Contai,	1865
Vivian, G. W. Esq, Civil Engineer, Morshedabad,	1862
Vizianagram, His Highness the Rajah of,	1847
Voss, C. W. Esq., Merchant, Gopalpore,	1864
Wagentreiber, W. Esq., Tea-planter, Debrooghur,	1857
Walker,† G. A. Esq., Tea-planter,	1861
Walker, A. Esq, Merchant, Calcutta,	1867
Wall,† P. W. Esq., C. E., S. E. Railway,	1863
Wallace, Adolphus Esq., Rungajaun Factory, Golaghaut, Assam,	1866
Waller, Capt. H. E., District Supt. of Police, Monghyr,	1865
Walters,* Henry Esq.,	1836
Walton, Lt. Col. B., Military Store Keeper, Calcutta,	1867
Warneford, Rev. T. L. J., Port Blair,	1866
Warner, Thornton Esq., Emigration Agent for Trinidad, Kidderpore,	1867
Waterfield,† E. Esq., Civil service,	1846
Wauchope, S Esq., Civil service, Hooghly,	1848
Wavell, Wm. Esq., Civil service, Bograh,	1859
Webster, H. B. Esq., Civil service, Saharunpore,	1864
Webster, Geo. K. Esq., Civil Service, Chooadanga,	1866
Webster, Alexr. L. Esq, Manager Hoolungorie Concern, Jorehaut,	1867

	Admitted.
Weinholt, John Esq, Merchant, Calcutta,	1859
Weinholt,† W. Esq., Merchant,	1848
Wemyss, Sir John, Bart, Mirzapore,	1859
Weskins, Charles Esq., Merchant, Calcutta,	1854
Westmacott, E V. Esq., C. S., Gobindpore, G. T. Road,	1865
Weston, John Esq., Judge S C., Court, Magoorah,	1863
Whampoa, Mr. Merchant, Singapore,	1850
Whitfield,† E. H. Esq., Civil service,	1860
White, Major M. J., 21 N I. Meean Meer,	1862
Whitney, W. M. Esq, Merchant, Calcutta,	1860
Whittall, Dr. R., Dehra Dhoon,	1862
Whitty, Irwin J., Esq., Civil Engr. E. I Railway Chord Line, Sapha,	1867
Wickes, Haines Esq., Ex Engr., Chittagong,	1866
Wight,*† Robert Esq. M. D,	1836
Wilcox, Frederick Esq., Bengal Police, Pooroolia,	1867
Wilkinson, Major A. E., Cantonment Magt., Fyzabad,	1862
Williams, Fleetwood Esq, Civil service, Meerut,	1840
Williams, Walter Esq, Supt Dist Police, Etah,	1867
Williamson, Major James, Commandant 26th Regt N. I. Mehidpore, Central India,	1849
Williamson, Lt. W. J., Asst. Commr. Garrow Hills, Goalparrah, Assam,	1867
Williams J., Esq., Agra,	1859
Wilmot, C. W. Esq, Assist. Commissioner, Sonthal Purgunnahs, Rajmehal,	1859
Wilson, A. G., Esq., Deputy-Magistrate, Burhee,	1847
Wilson, Thomas Esq, Deputy Opium Agent, Gazeepore,	1848
Wilson, Charles Esq., Surgeon, 8th N. I. Bareilly,	1860
Wilson,† C. H. Esq, Merchant,	1860
Wilson, Lt. Col. H, M., Staff Corps, Benares,	1860
Windle, J. A. Esq, C E. Executive Engineer, Balasore,	1865
Wingrove, Clement Esq., Tea-planter, Debrooghur,	1865
Winson, Capt. Wm., Comg. 18 N. I. Bhaugulpore,	1865
Wintle, Charles F., Esq, Sub-Deputy Opium Agent, Bustee, Goruckpore,	1859
Wintle, Major E. H. C., Cantonment Jt Magistrate, Dum Dum,	1860
Wood, James M. Esq, Tingri Mookh, Assam,	1865
Woodbridge,† Geo. Esq, Eastern Bengal Railway,	1867
Woodcock, Lt. E. M., District Superintendent of Police, Seetapore, Oude.	1864
Woodford, Dr. O., Calcutta,	1863
Woomes Chunder Roy, Zemindar, Norail, Jessore,	1867
Woopendra Nauth Mittra, Baboo, Calcutta,	1867
Wordie, T. H. Esq., Merchant, Calcutta,	1863
Wright, H. Esq., Shapore, Punjab,	1854

	Admitted.
Wright, A. C. Esq , Deputy Magistrate, Jenida, ...	1865
Wright, Dr. Daniel, Residency Surgeon, Nepaul, ...	1866
Wright, Wm. Esq., Judge Small Cause Court, Cuttack, ..	1866
Wright, S. Esq., Principal Sudder Ameen, Dinagepore, ..	1867
Wroughton, Major H. R., Offg. Dpty. Asst. Commissary General, Dinapore, ...	1860
Wyatt,† G. N. Esq., Indigo-planter.	1861
YARDLEY, Arthur, Esq , Civil service, Aurungabad, ..	1866

Monthly Proceedings of the Society.

Tuesday, the 21st January, 1868.

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Monthly Meeting having been read and confirmed, the Members proceeded, in accordance with the Bye-Laws, to the election of Officers and Council for the current year. The President nominated Messrs. R. Blechynden and W. Ter Veen to act as Scrutineers, who reported the result to be as follows.—

President.—Mr J. A. Crawford.

Vice-Presidents.—Mr. S. H. Robinson, Cowr Harendra Krishna Bahadoor, Mr. S. Jennings, and Roy Hurrochunder Ghose Bahadoor.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. T. H. Mosley, Dr. C. Fabre Tonnerre, Major W. N. Lees, Baboo Peary Chand Mittra, Hon'ble J. P. Norman, Messrs. C Weskins, Wm Stalkartt, A. H. Mowbray, M. Henderson, E Broughton, L. Berkeley and Dr. Thomas Anderson.

Standing Committees.—Mr. M. Henderson and Cowr Harendra Krishna were added to the Grain Committee, which required strengthening.

Annual Report.

The Secretary read the Annual Report.

Mr. Wm Stalkartt moved the adoption of the Report, which was carried unanimously.

The Chairman said, now that the report had been read and adopted, he considered this the fittest time to make a few remarks to the Meeting, on one or two matters which had occupied the Society's attention during his long tenure of Presidentship. As he was now vacating this important post and leaving the country he wished to call attention to them.

And first, he said, as regards the garden question which is now and has for some time been engaging your consideration, I would advise you not to be induced to lay out your income beyond such amount as will leave you in the occupation of a small plot of land for nursery experimental purposes. I have often myself thought that we should do wisely to drop our Garden and to concentrate our efforts on the improvement of our Journal which circulates all over India, and which admits of being turned to better general account by our Members than a Garden at the Presidency. But there is, I admit, much to be said in favour of the opposite view, though the advocates of a Garden must, I think, restrict its object to the purposes which I have just named. If this object can be attained by co-operation with the Public, or with the Zoological Committee of the Council of the Asiatic Society in such a negociation as is now going on, so much the better

Another question which I should recommend you to press again on Government is the establishment of the Museum of Economic Botany Our Society first moved in this matter some 3 years ago, and offered to transfer to Government such specimens of vegetable productions as had accumulated in its Rooms during the many years that the Society has been at work. Government told us that the question would be considered when the Trust for the foundation of the Indian Museum had been legally constituted, and meanwhile referred it for report to a Committee which had been formed to take over, for this Museum, the collections of the Asiatic Society. The Committee's report was in favour of our Society's project The Trust has since been formed, and the Trustees have given in their first Annual Report Already there are indications of a controversy, such as has been for some time going on in London, as to whether the proper site for a Museum of Economic Botany is not rather in the Botanical Gardens than in the general Museum. I hope you will endeavour to have the question in this case decided in favour of the Indian Museum, where only under existing conditions, can vegetable products be usefully exhibited. Doubtless these are most instructive when associated with the living plants which yield them or are most nearly allied to them, as they are in the *Jardin des Plantes* at Paris But here there must be a difficulty in carrying out such a happy combination, and even our limited collection is far more useful where it is, than a more complete one would be across the river.

Lastly, I am in hopes that the Society will keep in view those useful institutions which were inaugurated in 1864 by our late Lieutenant-Governor, Sir C. Beadon, and of which I am aware that you all appreciate the full importance. It is expected, I believe, that next year will bring about at least a partial renewal of these useful District Exhibitions, which have been suspended by two years of disaster

The ordinary business was then proceeded with, and the following gentlemen proposed at last Meeting, were elected Members :—

Messrs. E C Van Cutsem, Frank Taylor, and A. M. Monteath.

The names of the following gentlemen were submitted as candidates for election :—

Lieut-Col J. A Steel, Bengal Staff Corps, Fyzabad.—proposed by Mr. Grote, seconded by Mr. Crawford

James Meldrum Esq., Johore,—proposed by Mr. Joseph Agabeg, seconded by Mr. [illegible]

Manager, Station Garden, Mehidpore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

H. B. H. Turner, Esq., Merchant, Calcutta,—proposed by Major W. N. Lees, seconded by Mr. Grote.

R. Mitchell, Esq., Merchant, Calcutta,—proposed by Mr. R. Stewart, seconded by Mr. Hugh Sandeman.

Captain Hamilton, Royal Artillery, Debrooghur,—proposed by Mr. P. T. Onraet, seconded by Mr. T. Grant.

The following contributions were announced:—

1.—Report on the vegetation of the Andaman Islands, by Mr. S. Kurz, Curator of the Herbarium of the Royal Botanical Gardens, Calcutta,—presented by Dr. Thomas Anderson, Superintendent of the Gardens.

2.—The Annals of Indian Administration for the year 1865-66 (continuation of Part 1, Vol. XI.),—from the Government of Bengal.

3.—Report of the Committee of the Bengal Chamber of Commerce, from May to October, 1867,—from the Chamber.

4.—An enumeration of the Indian Species of *Acanthaceæ*, by Dr. T. Anderson, Superintendent of the Royal Botanical Gardens, Calcutta,—from the Author.

5.—A collection of bulbs of Achimenes, Gesneras, Tydeas, &c., raised at Gowhatty, Assam,—from the Rev. T. A. Firminger.

6.—Two very fine Sugarcanes, raised at Nauthpore Factory, Dacca, from Bombay stock,—from Mr. M. Dunlop de Dombal.

On the recommendation of the Council, Wednesday, the 12th February, was the day agreed on for the Annual Show, and the judges in each department were appointed.

The Secretary submitted letters from several Members in response to the advertisement in respect to the selection of vegetable seeds for next season. A large majority being in favor of seeds from France, it was agreed that only half the usual quantity be ordered from Messrs. Carter & Co., of London.

A carefully drawn up and useful report from Mr. John Scott, the Curator of the Royal Botanic Gardens, on the result of his sowings of flower seeds from Messrs. James Carter & Co., and Messrs. Vilmorin, Andrieux & Co., of Paris, was also submitted, and extracts read therefrom. Mr. Scott's report tends to show that failures may often occur both from exotic seeds being sown too early in the season, and from neglect in the preparation of the soil, rather than from any inherent defect in the quality of such seeds.

"I herewith enclose, in a tabular form, the report on the germination of Vilmorin, Andrieux & Co.'s collection of seeds, which you were good enough to send me for trial in the Botanic Gardens. The seeds were sown on the 16th November and the majority of those enumerated in my report had germinated by the 1st of December. I may state that a portion of each kind was sown in flower-pots, and the remaining portion on prepared sites in the flower-borders. It is almost superfluous to say that by "prepared sites," I simply mean the addition of vegetable mould and sand, which are most essential to the germination of nearly all the finer kinds of exotic flower seeds, in the relatively ungenial soil of the Gangetic delta I am indeed inclined to attribute much of the disappointment in the flower seeds imported by the Society to the frequent neglect of such precautions by Indian floriculturists. The careful and judicious watering of seeds cannot either be too strongly impressed, and this I would more especially notice, as I am not a little surprised to find in the really useful work of the Rev. T. A. C. Firminger, on Indian Gardening, a very injudicious system cited, and I may say tacitly recommended For details, I refer you to page 248 of the above work, and merely say that the mode is to sow the seeds, place them under water, and allow it to drain off. Theory and practice are alike opposed to such treatment; and the results would assuredly be the rotting of a very large percentage of the seeds under any circumstances; but of course greatly intensified when applied to seed imported from Europe.

Illustrative of those points, or at least showing that the general treatment of the seeds is a source of disappointment paramount to that from deteriorated quality, I beg to enclose a report also on my success with the collection of annual flower seeds supplied by the Society, from Messrs. Carter & Co., and of which I am told that Members have made very unsatisfactory reports.

"In the subjoined tabulations, I have arranged the results in four columns, giving in each an approximate estimate of the percentage of seeds which have germinated; thus in column 1, the germination is from *one* to *six per cent*, in column 2, from *six* to *twenty*; and so on to *ninety per cent*. I need scarcely add that the contracted terms opposite the names in the respective columns have reference simply to the relative degree of germination.

"A cursory summary of the tables gives the following result:—of the collection from Messrs. Vilmorin, Andrieux & Co., *three* kinds only have entirely failed, and of the remaining 47 kinds the average germination is 5 at 4·2 per cent; 5 at 14·2 per cent; 10 at 42 5 per cent, and 27 at 69 7 per cent.

"In the collection of Messrs. J. Carter & Co, 6 kinds have wholly failed, and the average germination of the others, 58 in number, is 4 at 5·1 per cent; 13 at 29·3 per cent; 23 at 42·1 per cent, and 18 at 64·4 per cent. Thus the average germination of Vilmorin, Andrieux & Co's seed is 50·8 per cent,—that of Carter & Co.'s is 43·6 per cent; affording a difference of 7·3 in favor of the quality of the seeds from the first mentioned firm.

"Such comparisons, however, as the present are faulty, inasmuch as the respective collections contain, in many instances, very different kinds of seeds, each of which has its own peculiar constitution, involving greater or less facilities for modification and assimilation to changed conditions, affording very evident sources of error in the mere numerical comparisons I have instituted. I have thought it right to allude to this in case Members might be disposed to regard my experiments as conclusively indicating a real superiority of the seeds from the French firm In my opinion there is every reason to be satisfied with the results of both collections, and I may also add, that the seeds received in the Botanic Garden by direct order from the firm of Messrs J Carter & Co, have generally germinated well There is, however, one very important advantage which Continental grown seeds are likely to possess over those grown in Britain, for cultivation here, viz., the attainment of a stage in acclimature sufficient to enable us to flower many plants for which we are now dependent on previous acclimatization in Upper India"

The Chairman said that he was sorry to find that the last announcement he would have an opportunity of making from the chair, was that of the death of an old Office-bearer of the Society, and of a personal friend of his own—Baboo Ramgopaul Ghose This gentleman had been several times a Vice-President, and until lately had always been one of their working Members During the last few years his health had given way, and intimation of his death had just been received He would beg to read the following, which was moved by Baboo Peary Chand Mittra, seconded by Dr Thomas Anderson —

' That this Meeting desires to put on record its deep regret at the death of Baboo Ramgopaul Ghose, who was connected with the Society for many years, and rendered valuable services in furtherance of its objects ' Carried unanimously

Mr Grote then briefly explained the cause of his resignation of the Presidentship, and after commending to the consideration of the Society the few observations which he had previously addressed to them, and assuring them of the pleasure it would give him to be of use to the Society in England, he yielded the chair to the new President, and left the Meeting

Mr Crawford, on taking the chair, said, he thanked the Meeting for the honor they had done him in electing him President of the Society for the current year. Succeeding as he did so distinguished a member of the Society as their late President, Mr Grote, he felt that he followed at a very great disadvantage Mr Grote was distinguished not only as a scientific botanist but as a Naturalist as well, and he added to his other accomplishments a great knowledge of the affairs of the Society, and was ever ready to give the Society the benefit of his long experience on whatever occasion it was required. There was one point on which he, Mr. Crawford, would not yield to any Member of the Society—not even to their late President,—and that was, in an earnest desire for the welfare of the Society, and he trusted that when it came to him, at the close of the year, to lay down the office with which they had honored him, they would find that their choice had not been misplaced.

Mr Jennings briefly returned thanks for his nomination as a Vice-President.

The Secretary then read the following resolution from the Council, passed at their last Monthly Ordinary Meeting, on Mr Grote's resignation of his seat in their body —

"The Council cannot accept the resignation of Mr Grote as President of the Society, without placing on record their deep regret that his approaching departure from India renders such a step necessary. The Council consider it due to record their sense of the untiring zeal and ability he has brought to bear on the various subjects which have come before the Society during the period of his Presidentship extending over seven years. The Council are fully aware that they are anticipating the wish of the Society at large in proposing, at the next General Meeting, the nomination of Mr. Grote as an Honorary Member, and the presentation of an appropriate Address previous to his departure for England."

Thereupon it was moved by Dr. Anderson, seconded by Baboo Peary Chand Mittra, and resolved unanimously:—

"That this Meeting desires to place on record its sense of the very valuable services rendered to the Society by Mr Grote, who now vacates the Presidential Chair, and that this Meeting cordially approves of the suggestion of the Council to present him a suitable Address, and to elect him an Honorary Member."

Dr. Anderson read extracts from a paper which he had drawn up for publication in the Journal, entitled "Notes on the formation of the Royal Botanic Garden."

Dr. Anderson said that he had drawn up these notes and had copies made of all the papers referring to the formation of the Botanical Garden in the end of last century, in consequence of the prevalence of an erroneous impression that the ground occupied by the Botanical Gardens had been bequeathed to the Government by Colonel R. Kyd, under certain conditions. The papers which were now made public for the first time showed that the Botanical Gardens had been established some years before Colonel Kyd's death, and that the Government had acquired the ground not by gift from Colonel Kyd but by satisfying the natives in possession of the land. Dr. Anderson said the papers are in a rather bad state of preservation, and it was, therefore, very desirable that they should be preserved by being printed.

The best thanks of the Meeting were given to Dr. Anderson for his paper.

Mr. S. H. Robinson said that whilst joining the Meeting in their thanks to Dr. Anderson for the interesting paper he had just read, he wished to say a few words respecting another paper which Dr. Anderson had promised to the Society. At the last Annual Meeting a Resolution was passed to the effect that "Dr. Anderson should be requested to favor the Society with copy of his scheme for laying out the Government Botanical Gardens, which had been approved by Government;" and it was understood that Dr. Anderson had promised to comply with this request. Now he, Mr. Robinson, was sure that Dr. Anderson had not the slightest intention of treating the Society with discourtesy by neglecting to fulfil his promise, yet, as a whole year had elapsed without the request having been complied with, he thought that some explanation was due to the Society for the delay, and Dr. Anderson would no doubt avail of the present opportunity to afford such explanation.

Dr Anderson said there was evidently some misunderstanding about this matter, and he therefore gladly availed himself of this opportunity of making some remarks concerning it. While he was travelling in Bhootan during last February or March, he received the first intimation of the resolution that was passed at the Meeting of January 1867, requesting him to favor the Society with a copy of the papers on the scheme for planting the Botanic Gardens, which had been approved by Government.

He was unable to comply with the request before he left Calcutta on the 28th May, but in June or July last he wrote either to the Secretary or to Mr. Grote, the President, intimating his (Dr. Anderson's) willingness to comply with the resolution by submitting a full account of the arrangement which he had followed in planting the Botanical Gardens. He understood that, that portion of the letter referred to, had been read at the Meeting either in June or July 1867. This intimation of his (Dr. Anderson's) willingness to comply with the wishes of the Society was met by a resolution, that the resolution passed in January, was merely a request to be supplied with copies of the letters referring to the scheme for planting the Botanical Gardens that had been approved by Government, and not the account of the arrangement that he (Dr. Anderson) had followed in planting the Garden. He understood this resolution as a refusal of the offer of the paper which he had tendered to the Society, through the President, and as he had fully explained his reasons in that letter for wishing to publish a full account of the arrangement he had followed, in preference to the papers asked for by the Society he believed he had shewn no discourtesy to the Society in taking no further steps after he had been made acquainted with the resolution passed at the July Meeting. He begged to assure the Meeting that he had no wish to treat the Society with discourtesy, indeed, on reading the resolution which had been passed at the Meeting in July, he felt that his offer to meet the wishes of the Society in the manner, in his (Dr. Anderson's) opinion, most creditable to himself and the institution over which he had the honor to preside, had been somewhat discourteously received.

Mr. Robinson said, he remembered the circumstance of the offer just referred to by Dr. Anderson, but that it was the impression of the Meeting at which it was mentioned by the President that Dr. Anderson had offered to furnish something different from what the Society had applied for, and that the Secretary had consequently been asked to refer Dr. An[illegible]rson to the original Resolution passed by the Society in January last.

The Secretary then read the part of the Proceedings of the Monthly Meeting of July last, referring to the matter.

Dr. Anderson said, in explanation of his wish to publish, in the Society's Journal, or in that of some other Society, the account of the arrangement he had followed, that such a scheme for the grouping of the plants in the Botanical Gardens, had necessarily, as a scientific matter, been left to himself, and that the mere official correspondence on such a subject must necessarily be an imperfect record. Further, that when the carrying out such scheme was prolonged on so great a length of time, modifications must occur in the execution, and, therefore, a perfect record could only be given after the completion of the work.

Dr. Anderson concluded his remarks by saying that he now wished to repeat the offer of the paper which he had tendered to the Society in July, through the late President, and stated that the paper would be a full record of the arrangements followed in planting the Botanical Gardens, and which would be accompanied by copies of the official correspondence on the subject, as an appendix.

On the motion of the Chairman, Dr. Anderson's offer was accepted by the Meeting with thanks.

Mr. Jennings brought to the notice of the Meeting, the many robberies of Orchids and other valuable plants which had recently taken place in Calcutta and the suburbs. He thought the matter becoming so serious as to call for attention from the Society, as a few more such losses would inevitably discourage private individuals from importing any more valuable exotics. After some little discussion on the subject it was resolved that a Reward of Rs. 200 be offered to any person who may give sufficient evidence to lead to the conviction of the guilty party or parties; and that the same be advertized in the leading native papers of the Presidency as well as in the *Englishman* and *Daily News*.

A letter was read from Dr. Forbes Watson, dated London, 3rd December, in response to the Society's application for seeds of *Chenopodium Quinoa*, Mahogany, and Esparto Grass. "On the receipt of your letter regarding the Quinoa seed,"—writes Dr. Watson,—"I communicated with Messrs. Anthony Gibbs & Sons, who have connections in South America, and they have sent instructions to forward to this, the quantities named in my letter to them, *viz.*, one cwt. of each kind, "sweet" and "bitter." Once we have established the connection with the spot of production it will be easy to get larger quantities as wanted. I am sorry to say that neither the Mahogany nor Esparto seed have yet come to hand. I have written again on the subject."

Read a letter from Dr. Geo. Henderson, Umritsur, on the subject of acclimatized cauliflower seed:—

"The cauliflowers grown here, by the natives,"—observes Dr. Henderson,—"are finer than any I have seen elsewhere. Some of the fields of them are from 5 to 10 acres in extent, each head of cauliflower being little under a foot in diameter, and as good in quality as I have ever seen. These are all grown from seed ripened here, and I am now trying to purchase a number of plants to preserve for seed, to send you in spring. I get the plants at one anna each, and the other expenses may amount to an anna more, say, two annas a plant; 4 plants would give about a pound of seed at least, possibly twice that quantity; so if you want me to secure enough to supply a maund of seed, please let me know at once, and I will secure it if I possibly can, that is, if I remain here until the seed ripens."

The Secretary mentioned he had thankfully accepted Dr. Henderson's offer.

Mr. Jennings submitted a flowering plant of *Vanda cerulea*, for which six marks were awarded.

(*Wednesday, the 26th February*, 1868.)

J. A. CRAWFORD, ESQ., *President*, *in the Chair*.

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected *Ordinary* Members *viz*:—

Lieut.-Col. J. A. Steel, Manager Station Garden, Mehidpore; Messrs. H. B. H. Turner, R. Mitchell, James Meldrum, and Captain Hamilton.

Honorary Member, Arthur Grote, Esq.

The names of the following Gentlemen were submitted as candidates for election:—

J. H. Bridgman, Esq., Gorruckpore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Lieut. T. W. Hogg, Assistant Commissioner, Saugor,—proposed by Captain H. E. Waller, seconded by Dr. J. Macleod Cameron.

A. Graham, Esq, Merchant, Calcutta,—proposed by the Hon'ble J. P. Norman, seconded by the President.

Captain McDougall Gleig, Bombay Invalid Establishment,—proposed by Colonel W. H. Anderson, seconded by the Secretary.

Rajah Bahadoor Dewan Roodur Purtab Sing, of Punná,—proposed by Captain W. Kincaid, seconded by the President.

A. R. Bainbridge, Esq., C. S., Burdwan,—proposed by Mr. A. Eliott Russell, seconded by the Secretary.

C. F. Carleton, Esq., Belwah, Chumparun,—proposed by Mr. T. M. Gibbon, seconded by the Secretary.

Maharajah Dhiraj Joy Sing Deo Bahadoor, Maharajah of Chikari,—proposed by Captain Kincaid, seconded by the President.

C. E. Livesay, Esq., Tea Planter, Nutwunpore, Cachar,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Thos. Knight, Esq, Civil District Engineer, Bareilly,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Manager Public Garden, Bareilly,—proposed by the Secretary, seconded by Mr. Robinson.

The Rev. T. C. A. Firminger was proposed as an *Honorary* Member by the Council.

The following contributions were announced.—

1.—Plants of *Hoya splendens*, Vanilla species, Mangoosteen and *Areca Cocoides* and seed of *Barclaya* species,—from A. Grote, Esq.

The *Areca* (from Malacca) was received in a sick state and has since died.

2.—An assortment of plants of *Achimines* of sorts, of *Caladiums* of sorts; *Gesneras* and *Pelargoniums* of sorts; Vine cuttings of several kinds, and several Cacti,—from Mr. Muir of Oultree Park.

The Gardener reports that all these plants, with exception of the Pelargoniums, have arrived in good order. These have been presented in exchange for Orchids.

3.—A few seeds from South-Africa,—from Colonel W. H. Lowther.

4.—Some seeds of a Bean (*Mucuna*—?) and pods of the same,—from A. Galstin, Esq.

The following is extract of Mr. Galstin's letter respecting the above Bean :—

"In October 1866 I received from Patna, two amongst other seeds, of these beans, which I put in the ground in my garden in South Entally, but only one sprouted. The growth of the plant was very slow at first until the rains set in, when it threw its tendrils in all directions with amazing rapidity, and very soon covered the entire space of a trellis measuring 20 feet by 16 which I had erected near the spot occupied by the plant for pumpkins and other vegetable creepers that I had in my garden. In the middle of May it put forth clusters of blossoms, and in June and July it gave a plentiful yield of beans in large bunches. One bean had produced a thousand such bunches, the number of pods or legumes in each bunch varying from 6 to 18, and of the beans in each pod from 4 to 7, but the pods mostly contained 5 or 6 beans. The stem of the plant had now attained to 3 inches in circumference, and I am of opinion that the plant would have gone on bearing for several years, had it not been destroyed by the last cyclone. I may safely say that the average annual yield from a single bean would be 1,200 bunches, supposing each bunch to consist of 10 pods, and each pod of 6 beans, one bean would then yield on an average 72,000 beans in a year. I have had it served at my table, boiled, and when dried, it makes very good pea-soup, and is an excellent substitute for *dhál*, one of the staple articles of food of the natives of Bengal. It begins to spread out as I have before said in the rainy season and grows best in the shade. I have had several of these plants set at the foot of large trees in my present garden in North Entally, and shall let you know any peculiarities that I may notice in them."

5.—Seed of *Eucalyptus* species from Melbourne,—from Dr. Müller.

6.—A large collection of Orchids from Cherra Poonjee,—from C K Hudson, Esq.

7.—Two specimens of Sugarcane, A and B, from Aska,—from F. J. V. Minchin, Esq.

The following is the chemical analysis of these specimens —

	A (manure ashes.)	B. (manure ashes and refuse)
Water	81 30	80 61
Crystalizable Sugar ..	17·76	18·91
Grape and fruit Sugar ...	0·40	0·00
Foreign substances...	0·54	0·48
	100.	100·

8.—Specimen of a fibre from Jeypore.

The following is extract of a letter from Mr. Ockelton forwarding the above:—

"At the request of Dr. C. S. Valentine, Private Physician to the Maharajah of Jeypore, and Superintendent of the School of Industrial Arts here, I have to-day despatched to your address a parcel containing a sample of fibre obtained from a plant which grows wild in Jeypore. Dr. Valentine will feel much obliged by your submitting this sample to the Society's Fibre Committee, and letting him have, through me, at your convenience, a report thereon, also the Committee's opinion as to the heckling, and the probable value per cwt. or bazaar maund, of the fibre as an article of commerce. The cleaning and heckling of this fibre has just been attempted for the first time here, considerable improvement may, therefore, reasonably be looked for"

The Secretary mentioned that Mr. W. Stalkartt considered this fibre to possess great merit in length, strength and color. It is probably derived from an *Aloe* or *Agave;* but he had written for specimens of the plant and for other particulars

9.—Cocoons of a wild Silk yielder from Ranchee, Chotâ Nagpore,—from R. W. King, Esq.

The Secretary submitted a specimen of the floss obtained from this cocoon—probably *Cricula trifenestrata,*—and the following note from Mr Lotteri. This cocoon was brought to the notice of the Society in April last and on previous occasions —

"As I have had the pleasure of informing you personally, the cocoons of which you gave me a box of samples, although it is not possible to reel them, yet by means of chemical and mechanical processes they can be made to give a good result, as you will judge from the 6 cocoons which I have reduced to pure silk.

"Several firms to whom I offered this produce, as prepared by me, have given me considerable orders, and you will help me very much if you could refer me to those that can furnish large quantities either here or at Moulmein, for it would be new riches to India and an encouragement to increase the production."

The Council announced that they had elected the following Members of their body to the Committees of Finance, Papers, and Correspondence.

Finance.—Baboo Peary Chand Mittra, Messrs. William Stalkartt and S. Jennings.

Papers.—Messrs. J. A. Crawford, S. H. Robinson, Major W. N. Lees and Dr. Thomas Anderson.

Correspondence—Messrs. J. A. Crawford, S H. Robinson, and L. Berkeley.

A few plants were sent in for examination

From Rajah Sutt Churn Ghosal's Garden.—A few *Camellias, Francisceas,* &c.

From Dalhousie Square Garden.—*Amaryllis* and Heartsease.

From Mr. Samuel Jennings.—A plant in full flower of *Cœlogyne nitida,* for which 5 marks were awarded.

Mr. Geo. Bartlett submitted a fine flower of double *Petunia,* raised from seed acclimatized at Simla; and flowers of "Fredrika Gullaumi" which has blossomed probably for the first time in Calcutta.

HORTI-FLORICULTURAL EXHIBITION.

Read the following Reports of the Judges on the show of Vegetables, Fruits, and Flowers, held in the Sailors' Playground on the 15th February :—

Horticultural.—Notwithstanding the Cyclone of the 1st November, which retarded all Garden operations so considerably, the collection of vegetables exhibited on this occasion, though probably not equal to that of last year, was altogether very creditable to the exertions of the market gardeners.

The *Brassica* kind was, on the whole, well represented, though the Cauliflowers were not up to the usual standard of excellence. Cabbages, both small and large kinds, were in good condition, as also the Nolc-kole; of Brocoli there were a few very good specimens; among the Turnips (which shewed largely) there were some fine specimens, but many were overgrown. There was a large quantity of Potatoes of five kinds, amongst which were several fine specimens. Of Peas 6 to 8 kinds but much inferior to former shows. Carrots (horn and long orange kinds) were exhibited in large quantity, and contained several fine examples, and of the white kind there were a few very fine baskets. Celery, red and white, a larger supply than at previous shows, and very fine, but wanting somewhat in crispness, and not quite ready for table use. Of Lettuce (coss and cabbage) there was a fine lot and very tender. Of Endive (green, curled, and Batavian) there were a few very well blanched specimens. Asparagus and Spinach, inferior. Of Onions and Leeks, there were several fine samples. Beet (long and round) both kinds very good and very highly colored. A few baskets of Turnip-Radish were placed on the stands, overgrown and very inferior. Of Beans, the French kind was good, and the green long pod much finer than at previous shows.

Among the native vegetables there were a few good Yams and Pumpkins; Brinjalls and Maize, indifferent, some good collections of Beans were submitted; also Ginger, and Squash, and herbs of sorts.

In the Fruit department, Sapotas, Tipparees, Bael, Pummelows, long plums and Coccoanuts were well represented Oranges, Plantains and Pineapples, indifferent: some very fine baskets of Limes and Lemons were exhibited.

Rather more than one hundred Gardeners were present, and Prizes, amounting to Rupees 276, were distributed to the 47 successful competitors, as per list annexed.

Floricultural.—As was naturally anticipated, consequent on the Cyclone of the 1st November, the assortment of the plants exhibited on this occasion was altogether inferior to the display of previous years. There were, nevertheless, a few good collections, especially of Orchids, Ferns, Pelargoniums and variegated leaved foliage plants, which somewhat redeemed the character of the show.

Twelve gardens competed for the prizes for Roses; and the sum of Rs. 56 was awarded to ten of them. Captain Patterson's mallee received the prize for the best collection in pots; this collection, consisting of 15 plants, of which ten were new. Mr. Livesay's mallee gained the prize for the second-best collection, which though smaller in quantity, contained several new plants; Mr. Crawford's mallee for the third-best collection of 14 plants; and Mr. Wordie's garden the fourth-best of 22 plants These Roses would have showed better had the exhibition taken place a fortnight earlier.

For Orchids, the competition was limited. To Mr. John Lynam was awarded 50 marks for the best collection; none of these were in flower, it being too early in the season, but they were all exceedingly well grown. So rare an assortment has not previously been shewn as was represented by these [illegible]1 plants, which, with the exception of 4 or 5, consisted entirely of rare exotics. To Mr. Mowbray was awarded 25 marks for the second-best collection of 39 plants, the majority of which were indigenous.

The collection of Pelargoniums was tolerably large, and nearly all well grown specimens. Messrs. E. Lushington and John Wood gained the first prizes for the best and second-best collections in flower; and Messrs. H. and R. Wood's mallees for the first and second best collections not in flower.

Of Ferns, there were a few good collections. Mr. Zorab's gardener gained the first prize for the best collection, consisting of 17 species; Messrs. Ter Veen's and Stirling's mallees the second and third prizes

The Auckland and Dalhousie Square gardens gained the first and second prizes for collections of plants with brilliantly colored and variegated foliage: both collections were well deserving of this distinction.

The collection of Cactus was confined to one garden (Mr. Zorab's) and this was not so good as last year.

The Bulbous tribe was very poorly represented.

The collections of Heartsease, Asters and several other annuals were very indifferent. *Verbenas*, *Phloxes*, *Campanulas*, Larkspurs and some other favorite plants were also scarcely equal to those at previous exhibitions.

A few good plants of Camellias were placed on the stands. Rajah S. C. Ghosaul's mallee gained the prize for the best collection, and Mr. Longhurst's for the best specimen—a fine plant having no less than 30 flowers and flower-buds.

Of *Begonias*, *Oxalis* and Pinks the collection was very fair; there were likewise several good plants of *Antirrhinums*, *Tropæolums* and Sweet Peas.

The total sum awarded was Rs. 257, of which full details are annexed.

COTTON FOR EXPERIMENTS IN HYBRIDIZATION.

The Secretary brought to notice a letter addressed by Major Trevor Clarke, to the Editor of the *Cotton Supply Reporter*, and stated that Mr. Grote, to whom he had shown it, had expressed his willingness to take charge of any bolls or seeds which may reach the Society before May next. It was agreed that the letter in question be inserted in the Proceedings of this day's Meeting, and Mr. Grote's offer be thankfully accepted.

The following is the letter in question:—

"It was my intention to prepare some observations on certain matters relative to cotton improvement for publication in your present number. I have found myself however, unable to do so in time for this month's issue. In the meantime, I should feel greatly obliged to any of your Indian subscribers who could send me, through the Association or otherwise, specimens in the seed of native Indian cottons. Samples in the capsule would be the most valuable to me; next to this the contents of a good, well ripened boll, not separated from the wool; and, finally, seeds without the wool, when such alone are attainable. A few seeds, with or without the cotton, travel generally uninjured, even in a common letter. Well marked varieties, or such as are peculiar to a village or district, would be particularly acceptable, as also any wild, or reputed wild, forms, such, for instance, as that found in Scinde, and cultivated for a curiosity in botanic gardens. The Bourbon cotton as cultivated in India, is still a desideratum with me, as I have never been able to procure samples with the seed. I should also be glad to know if any variety or supposed variety of this cotton, *i. e.*, the Bourbon, is otherwise than smooth or glabrous in habit; or whether the blossom is ever spotted with purple at the base, as in the Sea Island, Egyptian, and ordinary native Indian. The old inferior sort now being supplanted in Khandeish by the Berarce would be welcome also a variety said to bear *white* flowers, and any yellow or nankeen cottons, the produce of the *native Indian* plant, *not* the *American*. I do not need the red-blossomed perennial sort, but should be glad of any *variety* of it, should such, as it has been said, exist. The produce of this plant has been more than once very well spoken of, and several times experimentally cultivated, but I cannot ascertain with what practical result. A specimen of it was shown by me a few days since to a really good judge in Manchester, who pronounced it at once a first-rate (Indian) cotton. It should certainly be crossed with the high-class herbaceous sorts, such as Dhollerah, Berar, and other well-stapled Indian kinds. It will be useless to attempt a cross between this and any American sort, such as New Orleans, Bourbon, Sea Island, Egyptian, &c. I may add that the cross recommended by me was really obtained many years ago in India by Dr. Burns, as I can attest, having seen both the sample produced and a drawing of the cross-bred plant. How easily could many of our Indian naturalist friends obtain a few of such hybrids, and with what good probable result. Here, it may take years to effect a given design of this kind, in consequence of the many difficulties surrounding the cultivation of a capricious and tender race of plants under glass in England. But I may have more to say about this on some future occasion. I have only to say that I shall feel pleasure in forwarding a few seeds of the most promising of my own cross-bred plants to any one who has the means and inclination to cultivate them, with a view to produce sufficient seed for a fair field experiment."

Letters were read:—

1.—From H. Cope, Esq., Umritsur, dated 25th January, acknowledging receipt of rose cuttings by the "Pattern Post," which have reached him in excellent condition. "That pattern post,"—writes Mr. Cope—"is an admirable institution. Your 27 rose cuttings reached me yesterday morning, and your letter in the evening. Many thanks for them and for the excellent way in which they were done up. They were all fresh, and most of the varieties new. I flatter myself I shall have the best collection of Roses in the Punjab this spring."

The Secretary mentioned that the above cuttings had been packed in the manner suggested by Mr. Cope, *viz.*, first wrapped round with moss, then with cotton well damped, and with oil cloth. Several parcels of cuttings had since been sent, by Pattern Post, to other parts of the country, and had reached in fair condition. Many parcels of seeds had also been recently forwarded through the same channel, which not only reach their destination much quicker than by banghy, but at one-fourth the cost.

2.—From R. J. Carberry, Esq., from the Allahabad district, in respect to the cereal crops in his neighbourhood.—"This year for miles around me the wheat and barley crops of the poor cultivators are covered with that destructive blight, 'gurrowee,' rust I believe we call it. Their out-turn will hardly reach one-quarter of what they usually got. This 'Gurrowee' is unusually severe this year."

3.—From S. H. Robinson, Esq., Secretary, Goosery Cotton Mills, applying for Macdonald's large roller gin for trial in their Mills.

The Secretary intimated that with the consent of the owner he had transferred this gin, which cannot be worked by hand power, to Mr. Robinson, who had promised to communicate the result in due time.

4.—From Col. J. C. Haughton, Commissioner of Cooch Behar, dated 17th January, applying for a large supply of native vegetable seeds, yams of sorts, tobacco, and cotton seed. The following is extract of Col. Haughton's letter:—

"I shall be glad to receive from the Society, through your kind assistance, supplies of all the native vegetable seeds and tubers of all roots used for food, such as yams, white sweet potato, &c. &c., of good kinds for distribution.

I shall also be glad to receive supplies of Sea Island cotton seed for the same purpose.

I would likewise be glad of a small quantity of seed of superior kinds of Tobacco—Manilla, Havanah, or American,—if to be had sufficiently fresh to vegetate in the coming season. It is the practice to sow Cotton and Tobacco, the latter for transplanting from March to July on this border. Cotton earlier and Tobacco later.

The native vegetables on this frontier are few in kind and very inferior in quality, hence my desire for better seed.

I am aware that there are many varieties, perhaps species, of Tobacco cultivated, but in Eastern Bengal, till within the last day or two, I have only observed what, in the absence of Botanical knowledge, I consider one species. The other day I observed a single plant in a tobacco plot, markedly differing from the rest. Its leaves were a deeper green, smaller and crumpled. Elsewhere I have since seen some small patches of it, and observed some plants in flower. This, instead of the usual roseate tint, was yellow. On enquiry, I was told it was not Tobacco "Tumakoe," but "Hanakoe," and that it was grown to a very small extent in Cooch Behar and Rungpore as a fancy article. That it was much stronger than "Tumakoe" and chiefly grown towards Assam. I shall be glad of information regarding it, or reference to the proper source from whence to get it.

I am prepared to expend Rs. 50 for seeds, &c., which I beg may be sent dâk to Julpigory."

The Secretary announced that Colonel Haughton's requisitions had been complied with.

5.—From Major R. Stewart, Deputy Commissioner, Luckimpore Assam, dated from Debrooghur, 6th January:—"I have just received sanction"—writes Major Stewart,—"for the expenditure of an amount not exceeding Rs. 500 for the purchase and distribution, among the ryots of this district, of potato for seed of a quality superior to that in general use, and also for the introduction of cereals, such as wheat, oats, gram, &c., and I want to know if you can help me in any way. The part of the district specially referred to, is Suddiyah, the easternmost point of all Bengal. The soil is good, but there is only a stratum of two feet of it over-lying sand, and it becomes dry and friable during the cold season. Potatoes were introduced among the ryots about 15 years ago, and grew luxuriantly, yielding abundant returns, but the plants have degenerated, and the potatoes have become miserably small and waxy. What do you think would be the best seed to introduce, and how is it to be got? I would want the seed up here by October next.

"Wheat and gram have been tried at Suddiyah with great success, but in days when there was no market for them on the spot, consequently their cultivation was left off. Now, any amount both of wheat and gram is in demand for local consumption to supply the European and imported population and cattle, so I shall be obliged by your giving me hints as to the best seed I can get for them."

It was agreed to comply as fully as possible with Major Stewart's request.

6.—From Dr. Mouat, Inspector General of Jails, L. P., requesting the aid of the Society in obtaining another collection of vegetable seeds for the use of Jail Gardens in the Lower Provinces.—Complied with.

The ordinary business having been disposed of, the President called the attention of the Members present to a paper which Dr. Anderson had previously intimated his intention of communicating to them. Dr. Anderson then rose and said,—"the Manuscript I have the pleasure to lay before the Meeting is a list of the plants described in Dr. Roxburgh's 'Flora Indica' (Carey's Edition of 3 volumes) arranged according to the Natural system, and with the modern names of the species, so far as they have been identified. The want of such a list was much felt by modern botanists who had occasion to consult the "Flora Indica." The Flora Indica (3 volumes edition) was published in 1831 and 1832, 18 years after the author's death, but the commencement of the work probably dated as far back as 1795, two years after Dr. Roxburgh became Superintendent of the Botanical

Gardens of Calcutta. When Dr. Roxburgh left India in 1813, he entrusted the Manuscript to his friend the Rev. Dr. Carey of Serampore, for publication, but no steps were taken to print the work until 1831, when Dr. Roxburgh's two sons, assisted by Dr. Carey, undertook the issue of the MSS. Dr. Wallich had previously commenced the publication of Roxburgh's Manuscript with additional notes, and with the description of many new species which Dr. Wallich had himself discovered. The publication of that edition ceased after the appearance of the 2nd volume.

The usefulness of Roxburgh's 'Flora Indica' is much impaired by the Linnean method having been followed instead of the Natural system. The ready consultation of the work is also much impeded by the great changes which have taken place in the modern views of the limits of the genera of Indian plants, and indeed of all tropical plants, the result in India of the enormous number of species of plants added to science during the last 30 years by the labours of Wallich, Wight, Griffith, Falconer, Hooker, and Thomson.

The list I now submit to the Society was drawn up by Dr Hooker, the late Mr. Alan Black, Curator of the Herbarium of the Royal Gardens, Kew, and myself. I brought the MSS to India in 1860 in an unfinished state, and since then,—working as I have been in the Garden where Roxburgh wrote the 'Flora Indica' and where I am surrounded by many of the trees and plants he planted and described,—I have been able to make many identifications which could not be determined in England.

The list in its present state forms an index to the 3 volumes of the 'Flora Indica' in which the Roxburghian plants are arranged according to the Natural System, each species having also its currently-adopted modern name in the opposite column. The list is thus a double Index, one part of which is valuable to those who know Indian plants only by the names given to them by the older botanists, and many of which are familiar to those who cultivate Indian plants in their gardens while the other will be useful to young students of Indian Botany, who, while knowing Indian plants by the modern names, may, however, wish to consult the full and accurate descriptions of the Flora Indica"

Dr. Anderson concluded his remarks by stating that if the Society consented to publish the list in question, he would be glad to pass it through the Press.

On the motion of the President the best acknowledgments of the Meeting were tendered to Dr. Anderson for placing this useful paper at the disposal of the Society, and for his kind offer of revising its publication, which was also thankfully accepted.

Dr Anderson next made some remarks on the names of certain varieties of *Dendrobium nobile*, living specimens of which, from the Botanical Gardens, were exhibited at the Meeting.

Dr. Anderson said that it had occurred to him, that it would be an advantage if these varieties of *Dendrobium nobile*, most of which were familiar to those who cultivated Indian Orchids, were distinguished by appropriate names, and he therefore proposed to distinguish the most conspicuous varieties as follows:—

1*st.*—The type of the species *D. nobile* he took to be the dark coloured, medium sized flowered one, of which the figure of *D. cœrulescens* in Lindley's Sertum Orchidaceum tab. 18 might be taken as a good representation.

2nd.—A pale variety of this, in which the sepals and petals are white with the exception of the slightest, almost imperceptible, tinge of rose on their tips with a pale lip with a faint blood-red spot at the base, should be called *D. nobile, normale var. pallida.*

3rd.—Dr. Anderson said he distinguished another marked variety of *D. nobile* in which the flowers are in shape and color exactly like those of the typical state of the species but are almost twice as large. The stems are more robust and some what larger than in the normal state of the species above referred to. He proposed to call this variety *D. nobile var. major*; and he thought that *D. Lindleyana* Griff. should be quoted as a synonym. Dr Anderson said that last year in the March or April Meeting he had shown a plant of this variety under the name of *D Lindleyanum* Griff along with Dr. Griffith's colored drawing of the plant. There were no examples of the variety in flower at present.

4th—A variety was constituted, Dr. Anderson said, by the plants with large pale colored flowers of which one or two specimens were shown at the Meeting. This differed from the darker colored large flowered variety *D. nobile* var. *major* (*D Lindleyanum*) in the color of the flower, especially of the sepals and petals just as *D. nobile normale* var *pallida*, is a pale flowered variety of the normal state of the species. This 4th variety Dr. Anderson said should be distinguished from the 3rd variety by the name *D nobile var major pallida.* These 4 states of this species of *Dendrobium* were apparently common in the Khasia hills and Sikkim.

Dr. Anderson lastly presented a specimen of the first 8 pages of a Catalogue of the plants cultivated in the Royal Botanical Gardens, Calcutta, and said that he hoped that the Society or the Council would favour him with any criticisms on the proposed publication. Dr. Anderson said that the date of the introduction of nearly all the plants cultivated in Bengal and of all that exist in the Botanical Gardens, or have been introduced into India by its agency had been entered by his predecessors in the records of the Garden so far back as 1793. As he (Dr. Anderson) intended to insert these dates in the Catalogue, the work would be to a certain extent a history of horticulture in India, and would show how much had been done by Government, by the means of the Botanical Garden, in introducing valuable trees and plants to India from all parts of the world. In a scientific point of view the catalogue, he trusted, would be valuable; as accuracy of nomenclature, reference to a good description and figure of each species, and when several figures existed, a citation of the most accurate one, would be attempted. The Roxburghian and Wallichian names would in all cases be included among the synonyms.

With reference to annual plants Dr. Anderson said it was not his wish to swell up the Catalogue by entering such plants indiscriminately, but he intended to admit only such species of annuals that produced good seeds in the Botanical Garden.

(*Wednesday, the 25th March*, 1868.)

J. A. Crawford, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen proposed at the last Meeting were elected *Ordinary* Members, *viz*:—

Lieutenant T. W. Hogg, Captain McDougall Gleig; Messrs. H. J. Bridgman A. Graham, A. R Bainbridge, c. s., and C. F. Carleton; Rajah Bahadoor Dewan. Roodur Pertab Sing, Maharajah Dhiraj Joy Sing Deo Bahadoor; Messrs. C. E. Livesay, Thos. Knight, and the Manager of the Public Garden, Bareilly.

Honorary Member, the Rev. T. A. C. Firminger.

The names of the following Gentlemen were submitted as candidates for election.—

Dr. Robert Brown, Political Agent, Munneepore,—proposed by Mr. C. B. Jennings, seconded by the Secretary

B. D. Colvin, Esq., Merchant, Calcutta, proposed by Mr. S. Jennings, seconded by Mr. J. A. Crawford.

B. J. Yates, Esq., Station Master, E I. Railway, Howrah,—proposed by Dr. G. R. Ferris, seconded by Dr. J. B. Barry.

Captain R. B. Hill, 8th Regiment, Bengal Cavalry, Gorruckpore,—proposed by Mr. C. F. Wintle, seconded by the Secretary.

The following Contributions were announced —

1.—A small collection of Orchids from British Burmah,—from F. C. Marshall, Esq.

2.—A collection of Orchids from Bhootan,—from S. Jennings, Esq.

About half of this collection was unfortunately received in a dead state.

3.—A few plants (Oxalis, Clematis, Funkia, &c.,)—from G. Bartlett, Esq.

4.—Fifty-two English Kidney Potatoes,—from J. H. Linton, Esq., through the President.

5.—A few Himalayan Pine and other seeds,—from G. P. Paul, Esq.

6.—A small packet of the dried stalks, &c., of *Luffa echinata*,—from Dr. Dickinson.

The following memorandum is submitted by Dr. Dickinson regarding the medicinal properties of this plant,—the "Bundaal" of the natives:—

A Cucurbitaceous plant or gourd, grows in hedges and dry uncultivated places in the N. W. P. Royle states it to be a powerful diastic in cases of dropsy, corresponding in qualities therefore to *Elaterium*, to which family it belongs. The part of the plant which has lately been employed is the stalk which, when dried, is made into an infusion, and is an excellent bitter tonic and febrifuge; but has latterly been employed as a specific in chronic enlargement of the spleen, dependent upon malarious fever.—Price 4 annas and a half.

The following Memo. from the Gardener, respecting the application of Cotton Seed Cake as a manure, was read.—

The Cotton Cake presented by Rev O B Smith has been tried on roses sweet peas and annuals On roses I did not find any difference between those manured by Cow manure or cake but neither did well as I expected, owing to want of water being too busy to water properly On peas I find it made a great difference, these were well watered On annuals I find it also did well especially on some Larkspurs two patches, growing side by side one with cake being very strong plants leaves nearly black one without, one-third the size, pale sickly leaves and weak plants

It appears to me nearly equal to cow manure If used on a large scale I think it would be best to spread it on the land and dig in just at end of rains, so a to get well decayed by the time the seeds are sown

A few plants were sent in for examination *viz* —

From Mr John Lynam's garden Plants of *Phalænopsis amabilis P grandiflora* and *Saccolabium miniatum* to each of which 3 marks were awarded

From Mr S Jennings' garden Plants of *Dendrobium densiflorum D Fimbriatum var oculatum* and *Cælogyne flavida* Five marks were awarded to the latter

From Mr H Mowbray's garden —A plant of *Saccolabium retusum*

From Rajah Suttshurn Ghosall —Two plants of *Eulophia virens*

From the Dalhousie Square Garden —Plants of *Phalænopsis amabilis Renanthera coccinea Vanda teres Dendrobium densiflorum* Lilies of sorts &

The Council submitted the following list of plants sent in to their last Meeting and to which they had awarded certain marks The Council further reported that they had agreed to receive such plants, in future at their Monthly sittings as are not likely to remain in blossom till the following General Meeting

From Mr S Jennings —*Dendrobium macrophyllum* (6 marks) D *Wardianum* (6 marks), and *Maxillaria variabilis lutea* (4 marks)

From Mr John Lynam —*Dendrobium alba sanguineum* (6 marks) D *Farmeri* (4 marks)

From Baboo Shama Churn Law —*Dendrobium Cambridgeanum* (2 marks) and D *Farmeri* (no marks)

Mr Geo Livesay exhibited some Lilies raised from bulbs received from Mauritius 3 years ago but which have only now flowered for the first time These lilies were much admired, especially two kinds which are apparently new Mr Livesay received them without names

Letters were read —

From Dr A C Maingay, Malacca,—presenting for the Journal a paper on the culture, &c., of the Tapioca plant

From the Secretary Canning Institute, Howrah,—applying for copies of the Society's Journal Application complied with

From Messrs Vilmorin, Andrieux of Paris acknowledging order for supply of flower seeds for next season and promising to afford to it their best attention.

The Secretary announced the receipt, from the Government of Bengal, of some more Statistical Returns on Rice cultivation.

An enumeration of the higher Cryptogams, cultivated in the Royal Botanical Gardens, Calcutta, was submitted by Mr. J. Scott, Curator of the Botanic Gardens, with a few prefatory remarks on the cultivation of these plants in Lower Bengal. It was shown that previous to the application—by the present Superintendent—of those light-thatched constructions used by the natives of Bengal for the cultivation of the "Pan" or bettle-leaf, comparatively few ferns could be kept in the Gardens. Thus in the Catalogue of plants of the Hon'ble Company's Botanical Gardens by Mr. Masters, 1843, 26 species of Cryptogams are recorded as in cultivation, and again in *Voigt's Hort. Sub. Cal.* 1845, 52 species are noted; (but this Mr. Scott regards with others who have seen the MS. lists of Roxburgh and Wallich—in Cryptogams as in Phœnogams—rather as a *register* of plants introduced to the Gardens, than a *register* of those in cultivation at any one period), while the above enumeration includes 266 species: thus exceeding even Voigt's record in the proportion of 5 · 1. These houses, however, have been found much better adapted to the cultivation of Orchids, Zingibers, and others of those shade-loving flowering plants from humid intertropical regions, than ferns, which, in general, require a much closer and moister atmosphere than that afforded by these structures. For the fern cultivation, therefore, a span-roofed glass house has been erected, and found to suit beyond all expectation. "Ferns" it was remarked "of truly temperate kinds from elevation of from 7 to 9,000 feet in the Himalayas, others from their humid tropical flanks and vallies; from the damp, foggy declivities of the Khasia Hills, the equable and humid jungles of the Malayan Peninsula and Archipelago, whose species are, in general, perennially verdant; as also the hygrometric and deciduous species from the drier parts of India; all of which—varied though their natural habitats are—luxuriate in the glass conservatory, even as they would in an European fernery."

The preface (of which the above is an abstract) and enumeration, were transferred for publication in the Journal.

Dr. Anderson said, that before the Meeting broke up he wished to offer a few remarks on the subject of that important staple—Tobacco. He had noticed in the Report of the Society's Proceedings for February a letter from Colonel Haughton, Commissioner of the Cooch Behar Division, remarking that a peculiar kind of Tobacco was cultivated along with the common species in the Bhootan Dooars. Colonel Haughton said, that this kind of Tobacco had leaves of a deeper green than those in ordinary cultivation, smaller and crumpled, and that the flowers were of a yellow color, instead of the usual roseate tint. This note had drawn Dr. Anderson's attention to the species of Tobacco cultivated in India.

Dr. Anderson remarked that he found it stated by some writers on Tobacco, that East Indian Tobacco was the produce of *Nicotiana rustica*, the species which yields the famous Latakia tobacco, but this was a mistake, as he believed the only species cultivated in India was the common Virginian tobacco, *N. Tabacum*, which, according to Royle, was introduced into India by Akbar in 1605, unless the plant referred to by Colonel Haughton were *N. rustica*. Dr. Anderson further said, that a large number of species of Tobacco was cultivated in the Botanical Gardens, and he showed fresh flowering specimens of most of them at the Meeting.

He drew the attention of the Members to a plant of the Shiraz Tobacco, *N. Persica*, of which he had received in 1866 seeds from Dr. Hooker, Director of the Royal Gardens, Kew, who obtained the seed from the British Ambassador at Teheran. This seed was first raised in the Cinchona Nursery at Darjeeling, and the seed gathered there had been widely distributed throughout the Bombay and Madras Presidencies through the Board of Revenue.

A large quantity of seed of this valuable kind had again been procured from Darjeeling. The plant was evidently well suited to the climate of Bengal, as vigorous plants had been easily raised in the Botanical Gardens, where also a large quantity of seed had been procured. Dr. Anderson read the following list of the 16 species of Tobacco cultivated in the Botanical Gardens, and nearly all of which were in flower, and specimens of which were shown. He said that seeds of several of them were available, but especially of *Nicotiana Persica*, the Shiraz Tobacco.—

1. Nicot. Tabaccum.
2 „ auriculata.
3. „ Persica.
4. „ Langsdorfii
5. „ alata.
6. „ multivalvis.
7. „ Texana.
8. „ Guatamalensis
9. Nicot. petiolaris.
10 „ ignata.
11. „ plumbaginifolia.
12. „ glaucum.
13. „ paniculata.
14. „ angustifolia
15. „ macranthum.
16. „ rustica.

Dr. Anderson said that the *Dendrobium*, which was exhibited by Mr. S. Jennings at the last Meeting of the Council on the 19th instant, (and for which as shown above 5 marks had been awarded), was a rare species which had just been named and figured by Mr. Warner as *D. Wardianum*. The plant had, however, been known before in cultivation, both in England and in the Royal Botanical Gardens, Calcutta, and Dr. Anderson, in support of this statement, exhibited an un-named drawing of the plant which had been made under the superintendence of Dr. Thomson, from a specimen which flowered in the Botanical gardens in 1856. The plant had been received in 1856 from Mr. Simmons, who found it in Upper Assam. The species had evidently been sent to England at the same time, where it flowered in Messrs. Jacksons' nursery in 1858, and was figured by Sir William Hooker in the Botanical *Magazine*, t. 5058, under the name *D. Falconeri var sepalis petalisque obtusioribus*,—a species, however, to which it could not be referred.

(Wednesday, the 22nd April, 1868.)

J. A. CRAWFORD, ESQ., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen, proposed at the last Meeting, were elected Members.—

Dr. Robert Brown, Capt. R. B. Hill, Messrs. B. D. Colvin, and B. J. Yates.

The names of the following Gentlemen were submitted as candidates for election —

E. J. Edgecombe, Esq., Assam Company, Nazeera,—proposed by Mr. George Goad,

Stephen G. Read, Esq., Surringa Indigo Factory, Gorruckpore,—proposed by Mr. C. F. Wintle;

R. Redpath, Esq., Assistant Superintendent of Police, Thatone, Moulmein District,—proposed by Captain J C. Middleton;

Major R. Stewart, Deputy Commissioner, Luckimpore,—proposed by Mr. W. G. Wagentreiber;

H R Wilson, Esq., c. s., Patna,—proposed by Mr. Wm T. Fraser;

The above nominations were seconded by the Secretary.

As a *Corresponding* Member, Dr. A. C. Maingay, Civil Surgeon, Malacca, on the recommendation of the Council.

The following contributions were announced :—

1.—Memoirs of the Geological Survey of India, *Palæontologia Indica*, No. 5, —from the Superintendent

2.—Seventh Annual Report of the Agricultural and Horticultural Society of Oude, 1867,—from the Society.

3.—Dr. Kenneth McLeod's Paper on Cattle Disease,—from the Government of Bengal.

4.—Reports for 1866-67 on the Administration of the Madras and Bombay Presidencies, of the Central Provinces, N. W. Provinces, the Punjab, and British Burmah,—from the Government of Bengal.

5.—A collection of plants (413) from the Royal Botanic Gardens,—from Dr. Anderson.

6.—An assortment of seeds of trees and shrubs from the Barrackpore Park,—from the Superintendent.

7.—Seed of *Chenopodium Quinoa* and of the Cork Oak,—from Dr. Forbes Watson.

Dr. Watson writes as follows respecting the Quinoa seed, in a letter dated from the India Museum, London, 20th March :—

"On the 7th instant I forwarded, per parcel post, to your address, eleven bags, containing from 2¼ to 2½ lbs each of the seeds of the *Chenopodium Quinoa* then just reached from Peru. I also to save time, took the same opportunity of sending, per post, an equal quantity to each of the under-noted, *viz.*, Dr. Jameson, Saharunpore; Dr. Brown, Secretary, Agricultural and Horticultural Society, at Lahore; and J. D. Forsyth, Esq., Commissioner, Jullunder; and, by to-day's mail, I have intimated to these gentlemen, that it is through the intervention of your Society that the seed in question has reached them,—that in reality they are indebted to you for it.

"I herewith enclose copies of various memos. about the Quinoa seed; three of which are new, having been received from Messrs. Anthony Gibbs and Sons, through whom the seed, at my request, has been obtained. the rest are from old but not very *come-at-able* sources and, therefore, may prove of interest. On another occasion I will send you an analysis of the seed now forwarded."

The best acknowledgments of the Society were tendered to Dr. Watson for the trouble he has taken in meeting its requisition. It was agreed that five of these bags should be transferred to Dr. Anderson for distribution at Darjeeling; that two be sent to Mr. McIvor for trial and distribution at Ootacamund; two to the Madras Agricultural Society for distribution to any of their members resident in suitable localities; one to the Deputy Commissioner at Shillong; and the remaining bag to be reserved for any applicants on this side of India. It was further agreed to publish in the Number of the Journal, now in the Press, the various memoranda forwarded by Dr. Watson.

8.—Twelve lilies from Mauritius stock, from the collection exhibited by him at the last meeting,—presented by Mr. Geo. Livesay.

9.—A sample of Rheea from Dinagepore,—from Mr. D. B. Nicol.

This sample, which Mr. Nicol sends for report, though of fair quality, is not equal to the average from Assam. Mr. Nicol remarks that formerly there used to be a good deal of Rheea grown in the Dinagepore district, but the cultivation has much decreased for some years past, there being no demand for the article.

EXHIBITION OF RARE PLANTS.

The Council submitted the following lists of plants for which marks were awarded at their Monthly Meeting on the 16th April:—

From Mr. A. H. Mowbray's garden.—4 Orchids of sorts, including a quite new *Phalænopsis*, to which 8 marks were awarded.

From Rajah Suttshurn Ghosal's garden.—12 plants, including an exceedingly well grown *Renanthera coccinea*, to which 10 marks were awarded.

From the Dalhousie Square garden.—22 plants in all, to which 12 marks were awarded, namely 4 marks for Gloxinias, and 8 for Asters.

From Mr. S. Jenning's garden.—A collection of 32 sorts of exotic Orchids, for which 112 marks were awarded in the aggregate. In this collection was a plant in flower of *Oncidium cebolleta*, a native of the West Indies, exhibited for the first time to the Society

From Mr. Lyman's garden.—14 Orchids including the rare *Vanda Batemanii*, to which 20 marks were awarded in all.

From Mr W Ter Veen's garden —A collection of *Caladiums* of 12 sorts, exceedingly well grown, for which 10 marks were awarded

From Capt Paterson's garden —A collection of 14 pots of *Caladiums*, well grown, for which 10 marks were awarded, and 4 marks for a good example of *Tydæa* species

From the Royal Botanic Garden —A collection of 20 very well grown plants, consisting principally of Orchids

From the Society's garden —14 Hippeastrums of sorts, all finely blossomed plants, 5 Orchids including *Dendrobium Parishii*, and some fine plants, in full flower, of *Lobelia heterophylla*

A further small supply of the bean, of which he submitted a large quantity at the February meeting, was contributed by Mr Galstin In his previous communication, Mr Galstin stated, that he had received this bean from Patna, under the native name of "Alkooshee' (*Mucuna pruritus*), but Dr Anderson having then expressed a doubt of the pods belonging to that plant, had since carefully examined them, and found them belong to *M. utilis*, Wall, which was introduced into the Botanical Gardens in 1838 from the island of Bourbon

The Secretary mentioned that this bean (the ' Pois Noire" of Mauritius and Bourbon), was largely cultivated in former years for five or six years consecutively, in the Society's garden among the sugarcane plots, (following the plan adopted at Mauritius) as it was found an excellent culture, tending to keep the ground moist and cool, and preventing weeds from springing up When the cane cultivation was discontinued this "Pois-Noire" was also abandoned The Secretary added, that he had received several applications from various parts of the country for portions of Mr Galstin's supply, but had still a quantity in hand to meet further demands.

Communications were read —

From A. Grote, Esq, dated from Cawnpore, 27th of March, forwarding some printed papers received from Mr Halsey, relative to the cost of cultivation and returns for land manured with *latrine poudrette* in the vicinity of Cawnpore during the year 1866 67, and which, he thinks, will be interesting to the Society (Transferred for publication in Journal).

From J P Langlois, Esq, Manager of the Goramarah Tea Estates, Chittagong, of which the following is an extract —

"I have found several trees (which are of the same family,) and resemble tea. The leaves are very similar, only a little more pointed at the end, and slightly thicker The bark of the tree is of a whitish grey colour I have cut one down to 2 feet, and it has formed in a large bush and flushes first rate. The leaves are so alike tea, that several planters who visited our gardens, when shown to them, mistook them for hybrid. I have not as yet seen these trees in flower, but whenever they flower, I shall send the Society flower and seed.

"It may be interesting to the Society to know that in the Goramarah gardens, two years' old plants have yielded last season 1½ maund an acre. That the plants are flushing very well in Chittagong, and that during the last season there were 18 flushes. This season the first flush was taken off the trees on the 16th March, and I have a second flush on flats, which will be ready for plucking in two or three days. The generality of 3rd year plants are 2½ feet in diameter. Mr. Geddes, the Collector, who has been *over* Cacher, visited the gardens yesterday, and said that he had seen nothing better there."

From A. E. Russell, Esq., Burdwan, dated 18th April, communicating a few horticultural items of interest.—

"It may be interesting to you to learn"—writes Mr. Russell—"that this year the turnips, radishes, and Savoy cabbages were seeding in Mr. Lowis' garden at English Bazaar. I saw both these vegetables in seed. I am not aware that seed had ever been got from them in Bengal before.

"I have been growing Petunias from cuttings plentifully, and have some plants carried on from last year by that means. I do not know whether it is generally known that this plan will succeed in Bengal; it is useful as a means of perpetuating any choice variety. I succeeded also in keeping over Lobelias, I have many plants saved over from last year still in flower. During last rains I grew a great many balsams, also from cuttings, from some of my finest plants. The plants raised in this manner, however, proved rather dwarf, though they flowered well.

"I have a very fine Cineraria now in flower. I had no idea that this plant would succeed so well in this latitude.

"Amongst my seedling Verbenas this year, is a very fine striped variety from Italian seed. It strikes me that you may be glad of a plant or two of it for the Society's garden; if so, I will send you some as soon as I have a few layers ready."

From Dr. J. D. Hooker, Director, Royal Botanic Gardens, Kew, in respect to the partial failure of the seeds supplied last year to the Society by Messrs. James Carter & Co.

The following is extract of Dr. Hooker's letter.—

"Messrs. Carter have sent me a copy of your letter on the subject of the want of success attending the cultivation of the seeds supplied by their firm, and have requested me to state to you, that the samples that were tried at Kew, have, *without exception*, germinated freely, and that the produce has been uniformly of the best quality.

"I should inform you that I appointed my Curator to select the seeds, that I instructed him to go to Messrs. Carter's on the day he was packing the seeds for you, and to take the seeds from the tin cases immediately previous to their being closed, and to do so with his own hands. I should further add, that our sowings were made under Mr. Smith's own eye, both of flower and vegetable seeds.

"My conviction is, that no fault lies with Carter, and that the cause of failure in India is most probably due to the pericarps of the fruits, or coverings of the seeds, not being so hardened as to protect, during a tropical voyage, their contents, and that this is to be accounted for by the want of sun in England, especially during the last two seasons I think that, in this respect, there is much difference in different parts of England, and that in most cases the Society would do well to get their seeds from the south of Europe At any rate, the experiment would be worth trying '

From Messrs James Carter & Co, acknowledging receipt of order for a portion only of next season's supply of seeds, to which they will give their best attention Expressing their regret at the seeds of last year not having given satisfaction but exonerating themselves from all blame —"We know from our own trials that the seed we sent the Society last year were the best that could be produced, and if further evidence was required to prove this, we think the letter Dr Hooker has written you will be ample

From Dr Brown, Secretary, Agricultural and Horticultural Society of the Punjab, returning thanks for contributions of seeds from this Society

Dr Anderson exhibited branches with ripe fruits of *Garcinia Livingstonii* T Anders from the Royal Botanical Gardens, Calcutta. Dr Anderson said, that this tree had for the last three years produced fruit in the Botanical Gardens, and that this year the crop was abundant The tree was raised from seeds sent to the Botanical Garden by Dr Livingstone, who found it growing on the low hills near the Zambesi river When the tree first flowered in the Botanical Gardens in 1865, Dr Anderson named it *Garcinia Livingstonii*, and under that name published a description of it in the Journal of the Linnæan Society of London, Vol IX, p 262 Dr Anderson said the fruit although sour, evidently contained a certain amount of sweetness when quite ripe that gave hopes of its quality being improved by cultivation. The plant was perfectly hardy in the climate of Bengal

Dr Anderson also showed two species of Orchids One a fine very large flowered *Cœlogyne*, which Dr Anderson said had been presented to the Botanical Gardens, by that indefatigable Botanist, Dr Maingay, who had, within the last few years, enriched the Botanical Gardens by contributions of many of the rarest plants of the Malayan peninsula. This species of *Cœlogyne* was said by Dr Anderson to be closely allied to *C speciosa* from Java, the figure of which in the Botanical Register for 1847, Dr Anderson showed to the Meeting

The other Orchid was a handsome *Saccolabium* from Sikkim, having a graceful drooping raceme of pale pink flowers. Dr. Anderson said he recognized this species as *S pallens* Cath, MSS., which Dr Lindley briefly described in his contributions to Indian Orchidology in the Journal of the Linnæan Society.

The best thanks of the meeting were tendered to Dr. Anderson for the exhibition of the above interesting fruits and flowers, and for his remarks thereon. Dr Anderson agreed, by request of the meeting, to draw up a notice of *Garcinia Livingstonii* for the Journal.

(*Wednesday, the 20th May*, 1868.)

J. A. Crawford, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen proposed at the last Meeting were elected *Ordinary* Members —

Messrs E J Edgecombe, Stephen Read, R. Redpath, H. R. Wilson, c s., and Major R Stewart.

Corresponding Member. Dr A. C. Maingay.

The names of the following Gentlemen were submitted as candidates for election —

Charles Chambers, Esq , c e., (E I. Railway,) Luckeeserai,—proposed by Mr. Walter Bourne, seconded by Mr. William Stalkartt.

W. J. H. Wagentrieber, Esq., Sonarie, Seebsaugor,—proposed by the Secretary, seconded by the President

Rajah Rughoonundun Sing of Soorsund, Tirhoot,—proposed by Mr. J. M. Becher, seconded by the Secretary.

C H Barnes, Esq., Colgong,—proposed by Baboo P. C. Mittra, seconded by Mr. W. Stalkartt

H. C. Barstow, Esq , c s , Etah,—proposed by Dr. J. W. Tyler, seconded by the Secretary.

Major-General H. Rigby, Royal Engineers, Barrackpore,—proposed by the President, seconded by Mr W. Stalkartt.

His Highness Inchi Wan Aboobuker Sree, Maharajah of Johore, k. c. s i,—proposed by Mr Peter Anderson, seconded by Mr. J. A. Crawford.

The following contributions were announced .—

1.—Transactions of the Royal Horticultural Society of London, vols. 1 to 7 of first series, and vols 1 to 3 of new series,—from C J Simons, Esq.

2 —Progress Reports of Forest Administration in Mysore, for 1865-66, and 1866-67 , in British Burmah, 1866-67 , and in the Province of Oude, 1866-67,—from the Government of India.

3.—Selections from the Records of the Government of Punjab (Public Works Department), Reports on Forests and Fuel Plantations,—from the Government of India.

4.—A small supply of certain kinds of acclimatized Tobacco Seed from the Royal Botanic Garden,—from Dr. Anderson.

The Abyssinian Tube Well.

Read the following letter from the President on the above subject .—

"I enclose an extract from the *Observer* of the 16th March on the subject of 'the Abyssinian Well Tubes.' The subject is one fraught with interest to this country, for the if Well Tubes can be successfully introduced into India, there is no saying what results may not ensue in regard to both agriculture and horticulture.

I have always been of opinion that with a plentiful supply of water always at hand, much of the effects of the high temperature during the hot season might be obviated, and that we might possibly grow crops and plants which we cannot now do. For one tank that keeps a decent supply of water, even before the hot weather sets in, there are ten that almost dry up. With three Well Tubes sunk, say, through the bed of such dry tanks, a supply of water might be obtained, with incalculable benefit to gardens and orchards. The cost appears likely to be light, and I think we should be somewhat neglecting our duty were we to hesitate to give the Well Tubes a trial. As a Society for the promotion of Agricultural and Horticultural improvements, we should, I think, take a lead in bringing such inventions to notice in this country.

"In regard to the question of the supply of drinking water for a country like this, these Tubes seem well adapted for that object, and I have already brought the matter to the notice of the Chairman of the Justices of Calcutta, and have suggested that Mr. Clark, then Engineer at home, should be called on to report on them, and if favorable to their introduction, should be requested to send some out for the purpose of being tried as an auxiliary means for providing water for the public, pending the completion of the Water Works now in hand.

"I would, therefore, feel obliged by your circulating this letter to my colleagues in the Council for an expression of their views on the subject of indenting for, say, half a dozen of the Tubes, of various lengths and bores, with the requisite contrivances for driving them in, and extracting them as detailed in *The Observer*.

"You are doubtless acquainted with the names of some persons who would undertake the task of purchasing them and shipping them, to us, in the same way that Cotton Gins and other machines have been purchased and sent out for our Society. I would lose no time if the Council agree with me in indenting, for by the time we receive the shipments *viâ* the Cape, the drying season will have come round, and we shall be in a position to put the invention to the test at once."

Resolved—On the recommendation of the Council, that three of these Tube Wells of sizes be ordered, and that the Secretary communicate with Dr. Forbes Watson on the subject by the next mail.

RESULT OF PROPOSAL FOR THE DIFFUSION OF AGRICULTURAL KNOWLEDGE IN BENGAL.

The Secretary next submitted the following Resolution of the Government of Bengal in respect to Mr. John Stalkartt's proposal and the report of the Special Committee thereon —

"Read proceedings in this Department for the month of March 1867, Nos. 25-28, relative to a plan recommended by Mr. John Stalkartt for promoting an improved system of agriculture in Bengal, in regard to which the Lieutenant-Governor desired to be favored with the suggestions of the Agricultural and Horticultural Society of Bengal and the Board of Revenue, Lower Provinces.

"Read letter from the Secretary, Agricultural and Horticultural Society, dated the 25th February 1867.

"Read also letter from the Board of Revenue No. 812 A., dated 4th March 1868 reporting on the above.

"Resolution.—The Lieutenant-Governor observes that Mr. Stalkartt's plan, as described in his letter above cited, is as follows.—

"'My plan is to get the zemindar to interest himself in the culture of the 'land, to assist the ryot by lending him improved ploughs and good cattle, and in 'consequence to receive a share of the increased produce and, therefore, he will be 'interested in it.

"'To do this I would employ a practical agriculturist of this country, whose 'duties will be to travel from Rajah to Rajah, or zemindar to zemindar, persuade 'them to set aside 20 beegahs in each village, and stimulate the ryots to grow, 'with the assistance of the zemindar, and under his superintendence, one farm of '20 beegahs in every village, so that the amount of produce may be, if possible, 'increased.

'With the expenditure, the practical agriculturist should have nothing to do, 'that should be the business of the zemindar who, of course, will do it as cheaply 'as possible, for labor is wasted in the villages, and, the result being known, prizes 'should be distributed to the successful competitors, at the various local Exhibitions, 'if possible, or perhaps a meeting might be instituted solely for the purpose.

"'In France there is the same difficulty of *small* farms, and the Emperor, 'to obviate this as much as possible, employs a number of Professors to make 'experiments and travel through the country giving lectures.

"'The present Colleges give instruction to many people who afterwards go 'into Law, the *curse of the country*, or Government, or Mercantile Offices, and 'there is no direct return for the heavy outlay expended upon them. Whereas 'the peasantry, who have no assistance given them, pay about three-fourths of 'the revenue to Government, and I hope, therefore, that this little matter may 'be conceded.

"'To obtain the services of a good man a liberal salary should be given 'say Rupees 700 per mensem, house allowance Rupees 150 per mensem, a 'tent, and the usual travelling allowance made by Government. As his 'Honor the Lieutenant-Governor of Bengal in conversation stated the difficulty 'there was in obtaining a good man, I take the liberty of proposing my cousin, 'Mr. John Stalkartt, late of Setulpore in Sarun, as a practical agriculturist of 'more than thirty years both in indigo, sugar-cane, wheat, &c.'

"2. The Agricultural and Hotricultural Society have expressed their approval of the main principle of Mr. Stalkartt's recommendation, and they also suggest that the model farm, when situated at Sudder Stations in the Mofussil where Colleges exist, might be made useful for illustrating lectures on agriculture, which the Society think should be delivered at such Institutions, but which (as they say) would be of far less utility in the absence of practical instructions.

"3. The Board of Revenue submit an abstract of correspondence from Commissioners, Collectors, Native gentlemen, and others likely to be informed on the subject, and their views are generally adverse to the practicability of Mr. Stalkartt's proposals.

"4 The Lieutenant-Governor himself considers that the plan is one which cannot at present be carried out with any reasonable hope of success.

"5 In regard to the proposed model farms, in establishing which the Agricultural Society seem to think that Government should take the initiative, the Lieutenant-Governor is satisfied that no advantage would result from such institutions commensurate with their expense, and he could not therefore feel justified, in view of the numerous demands for public expenditure on really practical objects, in recommending a grant of public money for the purpose.

"ORDER.—Ordered, that a copy of this Resolution, together with a copy of the Board's letter, and of its enclosure, be forwarded to Mr. John Stalkartt, and to the Agricultural and Horticultural Society, for information

"*Also, that a copy of this Resolution be forwarded to the Board of Revenue* for information."

By order of the Lieutenant-Governor of Bengal,

H L. HARRISON,

Junior Secretary to the Government of Bengal.

No. 1710.

"Copy of the Resolution and of the Board's letter forwarded to the Secretary, Agricultural and Horticultural Society for information."

FORT WILLIAM,
The 6*th April* 1868.

H. L. HARRISON,
Junior Secy. to the Government of Bengal.

Resolved—that this Resolution be entered on the Proceedings of this day's Meeting, and that the abstract of Correspondence submitted by the Board of Revenue be published *in extenso* in the *Journal* of the Society, in continuation of that published in the Proceedings of September, 1867.

The following is the abstract in question —

Abstract of correspondence connected with Mr. Stalkartt's proposed plan for spreading Agricultural knowledge in this Country.

THE Commissioner of the Presidency Division submits the opinions given by his Collectors, and some of the enlightened Native Landholders of the Division, remarking that all those in any way qualified to judge of the plan, were decidedly

No. 528, dated 20th September, 1857

against it, and that he had no kind of hope that any practical benefits would result from it. He then goes on to observe that there are two modes of introducing improved Agriculture into the country, *viz.*, *first*, to shew the people the practical advantages to be derived from it, and *second*, by the use of influence to induce them to try experiments before they are practically convinced of their benefit. With respect to the first mode, he thinks that neither the delivery of lectures by a stranger at long intervals, nor any thing that Government could do, would come any where near the effect that must have been produced during long years in Nuddea, Tirhoot, and such Districts, by the actual residence, in the midst of the people, of English Planters, keenly alive to their own interests, and devoted to Agriculture. If the second mode were to be adopted, he thinks it would be better to employ the influence of the regular Officers of Government, though even that is fast diminishing, than to rely upon the efforts of a Special Officer, without any power, real or supposed, for the good or ill of the people. He, however, fully concurs with the Native correspondents of the Collector of 24-Pergunnahs, that the Agriculturists of Bengal are no fools; that they are, as a rule, ready enough to take advantage of opportunities of improving their circumstances by the introduction of new Staples; and that very often they have very sufficient reasons for practices and omissions, that may seem to Europeans in their ignorance absurd. The Commissioner further instances the abandonment of the Steam plough in Jessore, and of the attempt to make Sugar in Tirhoot by means of Steam-worked Machines, as proofs that English improvements are not always adapted to this country. He also alludes to the failure in Tirhoot, of the attempt to improve the breed of cattle, by the introduction of the large strong breeds from Up-country. From the above remarks, however, he does not wish to argue that no Agricultural improvements should be attempted; but merely to shew that what was really practicable, had been partly and generally tried by the Planters in Bengal and Behar. He then adds, "we have reason for proceeding with great caution and humility, and not much reason for assuming too confidently that we can at present hastily enlighten this Agricultural, and after all not unintelligent population in such matters. Whatever may be attempted in the way of Model farms, I sincerely hope that they may be worked upon a scale within the means of our Agricultural population; otherwise, they will be no "Models" at all. As a rule we fail in all departments in this way to root any of our improvements in this country."

Collector of 24-Pergunnahs.—The Collector of 24-Pergunnahs is of opinion that the Scheme would not work.

Koomar Harendra Krishna.—Koomar Harendra Krishna thinks that the Scheme was neither practical nor feasible; that experiments in ploughing would not result in much advantage, as the royts had not much to learn in that respect, the soil being soft, and deep ploughing not being needed; and that the Zemindars would not be disposed to lay out money for Model farms unless Government led the way.

What struck him as wanting was the improvement of the breed of cattle, the substitution of good but cheap manures, the rotation of crops by the introduction of new and more profitable Staples, elementary lessons in Agriculture in the Vernacular Schools, and the more extensive study of the Physical Sciences in the Colleges.

Raja Sutt Shurn Ghosal.—Raja Sutt Shurn Ghosal, though he fully agrees in Mr. Stalkartt's views, doubts whether the plan would succeed He attributes the gradual degeneration of the cattle to the want of suitable grazing lands, and thinks that improvement in the breed of cattle would conduce far more to benefit the peasantry, than any premature and sudden attempt to diffuse Agricultural knowledge among them He is of opinion that the soil of Bengal does not require deep ploughing; that the present Zemindarry system, which does not tend to preserve the harmony which formerly existed between the Zemindar and his ryots, puts it out of the question to expect the former to interest himself in the manner suggested in behalf of the latter, and that the late Agricultural Exhibition held at Alipore, has shewn that the royts are not sufficiently advanced to appreciate the value of Prizes. He further points out the mistake into which Mr Stalkartt had fallen, in comparing the Students of the Colleges with the actual Cultivators of the field, observing that the generality of the Pupils belong to the middle class, and that the time is far distant when educated people will turn their attention to, and invest funds in, Agricultural purposes The compilation of elementary Works on Agriculture in the Vernacular, and their introduction into Vernacular Schools, together with practical lessons to the Pupils in the fields, would, in his opinion, be the best means for attaining the desired object

Baboo Digumber Mitter—Baboo Digumber Mitter points out that Mr. Stalkartt's suggestions are not likely to prove of value, and that they have been made without much thought of their adaptability to this country He observes that the physical character of the different Districts of Bengal and Behar is so different, that it would be impossible to get one man practically acquainted with the System of Agricultural in each, and that even if such a man could be got, his knowledge having been acquired from the people, would be nothing new to them, that a single Teacher or Lecturer would be of little use, as the number of Farms to be established under the proposed plan, would be so great that he could not visit each one oftener than once in ten years; that considering the difficulties that attended the efforts made to improve the Agricultural System in Great Britain, it would be vain to expect that a Lecture delivered occasionally in a language foreign to the mass of the people, would effect much with the proverbially non-progressive people of Bengal; that with rare exceptions Act X. of 1859 has conferred the rights of occupancy on the royts, and that, therefore, the Zemindar cannot look for any share in increased produce, obtained through his lending the ryot improved ploughs and good cattle, that very few Zemindars could be induced to sacrifice twenty beegahs in each village for a Model farm the Baboo supports his view by shewing that in his Estate in Cuttack, which yields him an annual profit of Rupees 10,000, 2,700 beegahs would be taken up for the Model farms, *i. e.*, twenty beegahs in each of the 135 villages, and that assuming the average rent at 1 Rupee per beegah, he would lose 2,700 Rupees, or more than one-fourth of his entire annual profits by aiding the Scheme. He also observes that the Model farms must have much the character of experimental gardens, and that, therefore, they can hardly be expected to make sufficient returns to cover the cost of the intelligent superintendence necessary to conduct them properly, and of the experiments; that deep ploughing is practised by the ryots where necessary, but that it is generally not necessary, that the ryots are not slow to cultivate foreign fruits, vegetables, &c., when they find it profitable to do so, that a little deeper insight into things, and a better knowledge of the country, its climate and physical peculiarities, would soon dispel the delusion, and make it apparent that a better breed of cattle was not only not wanted for growing paddy, the principal Staple of the country, but that if introduced it would fast disappear, or be reduced to a more wretched condition than the native breed The Baboo explains that he does not wish to assert that a better breed of cattle is not desirable for some purposes, or that the Agricultural wealth of the country may not be vastly augmented by the application of right means, but that he is of opinion that Mr. Stalkartt has neither rightly appreciated the real wants of the country, nor proposed means likely to supply them. The Baboo suggests the establishment of a few large Model gardens to serve both as Nurseries for the supply of seeds, grafts, &c., at low prices, or gratuitously to the people, as well as Schools for practical instruction; and the distribution gratis, or at nominal prices, of popular pamphlets in Vernacular on Agriculture, the expense being met by public subscriptions supplemented by State aid. He also suggests theoretic instruction in the Vernacular Schools

Collector of Nuddea.—The Collector of Nuddea thinks Mr. Stalkartt's suggestions somewhat visionary. He recommends the formation of Agricultural Societies in each District, each Member subscribing 10 Rupees a year, and Government contributing a sum equal to the subscriptions With the funds a Farm of beegahs 200 or 300 under European management should be established for the trial of every description of Cultivation, with Farm Bulls of superior breed to serve the ryots' Cows, at a trifling rate, and with the view of convering the losses that might be incurred in Agricultural experiments, arrangements should be made for breeding Poultry and fattening Sheep for sale.

Baboo Kishen Kishore Ghose.—Baboo Kishen Kishore Ghose denounces the Scheme as impracticable, urging many of the arguments advanced above; while four other Zemindars, without entering into the subject, make what Mr. Chapman terms, somewhat obsequious offers to try the plan.

Collector of Jessore.—The Collector of Jessore is quite sure that as far as his District is concerned, the plan will not succeed, the land is so surprisingly fertile that even with the System of ploughing adopted by the ryots, the return of produce is very large, and the yearly inundation is so fertilizing in its effects, that but a very moderate amount of ploughing ensures a good return Steam ploughs have been tried by Planters, but given up as the existing System works better Collector thinks good results may be expected from extensive manuring, the establishment of Model farms at Sudder Stations and Sub-divisions, and the introduction of Bulls of good breed into the various Districts. He, however, remarks that it is his firm belief that neither the Zemindars nor the people in their present prosperous circumstances, will help at all in the matter.

No. 584, dated 30th November, 1867.

The Commissioner of Burdwan.—The Commissioner of Burdwan doubts the success of the Scheme For deep ploughing good Bullocks, he remarks, are necessary, and there is a general impression that the cattle of the Lower Provinces are unfitted for the labor. He, however, differs from this opinion, from close observation, and from having for years bred numbers of the pure indigenous breed, which from its size and hardiness of constitution, is better suited to the appliances of Agriculture in Lower Bengal than any mixed or cross breed The sole cause of the cattle being unfitted for farm uses is, not in the breed, but in their rearing, in their being deprived almost entirely of the dam's milk, and tethered day and night to a post away from every chance of getting sustenance. The expense, moreover, of maintaining cross and improved breeds would, in the almost entire absence of pasture lands, be too heavy for the ordinary cultivator. Further, excessive culture, or *chass*, (ploughing) is not required for all sorts of land, especially rice lands, which represent nine-tenths of the cultivated area in Lower Bengal. Some lands require to be ploughed oftener, but iteration, not depth of ploughing, is what is required; in support of this view Commissioner cites the case of a large field, part of which was, during the late Divisional Exhibition, ploughed most carefully and deeply with English and improved Native ploughs, the rice crop, however, did not differ at all from the crop on the other part of the field cultivated with the ordinary plough and harrow. The Natives are alive to the benefits of good cultivation, and adopt it where rents are high, where the rent is low, little regard is paid to cultivation. With the exception of Baboos Hit Lall Misser, Joykissen Mookerjee, and Saroda Persad Roy, Commissioner thinks there is not a single Zemindar in his Division, who would co-operate as suggested by Mr. Stalkartt. It would be impracticable for a single Lecturer to carry out the object intended, even in a very small area during the year. Theory must precede practice, Commissioner, therefore, suggests the establishment of one or more Agricultural Colleges, to be abolished when a sufficient number of Students had acquired and completed a course of Study, and been distributed over different parts of the country.

The Collector of Bancoorah.—The Collector of Bancoorah thinks Mr. Stalkartt's plan would rapidly end in Landlords compelling the ryots to cultivate a "Zeraat" for themselves, under the name of a Model farm. He thinks each Agricultural College should have a Model farm attached to it, to shew the ryots practically the benefits of an improved system, adapted thoroughly to the peculiar circumstances of the Country

Collector of Beerbhoom.—The Collector of Beerbhoom is of opinion that the Scheme is too far in advance of the present state of the Agricultural population, to admit of its being carried out successfully. The System of small holdings and cottier tenants is a bar to any great improvement in Agriculture capital, which the ryots do not possess, being required for improvements. The stimulating of the Zemindars to turn their attention to Agriculture by degrees, the formation of Agricultural Societies, the exportation of rice, and high rents will, he thinks, do much to improve Agriculture

Collector of Burdwan.—The Collector of Burdwan, though he thinks the proposal good, so far as it goes, would not incur the expense merely to illustrate the effects of deeper ploughing, what is really wanted is irrigation, a practical knowledge of the components of the soil, and the rotation of crops Good might result if Government were to cause the different soils in each District to be carefully analysed, and to circulate directions for the treatment of each kind of soil Model farms to illustrate the Systems to be followed being established as suggested Efforts should be made to improve the breed of cattle by Government Studs or Agricultural Societies and private Companies. No Scheme will succeed unless the profits of his expenditure and labor are secured to the Cultivator, whereas in this country the Landlord reaps the lion's share of improvement Would like to see Government offer entire remission of Revenue to any *Zemindar* who would make a *boná fide* permanent settlement with his ryots, recouping themselves by taxes which would fall on the mass of the people.

Collector of Hooghly.—The Collector of Hooghly does not think the plan will succeed, the example set by Indigo Planters has produced no sensible alteration in the ryots' mode of cultivation, and even the example set by Mr Stalkartt himself at Seetulpore, for more than fifty years, has not been followed by his neighbours, though not from want of Capital. Expensive cultivation will not pay in the case of ordinary crops like rice. If Model farms are to be established, none but the simplest appliances should be used, or the experiment will fail. Zemindars cannot be expected to buy costly Ploughs and Bullocks to lend to the Ryots when, without any expense, he gets a half share of the produce by letting out his seer land.

Collector of Howrah.—The Collector of Howrah thinks the plan will not succeed, unless a practical Agriculturist were entertained for each Division. He would, however, confine the experiment to Metropolitan Districts, or Districts such as Tirhoot, where there are large Zemindaries.

EFFECT OF THE LATE CYCLONE ON MANGO TREES.

Read the following note from Mr. Samuel Jennings :—

"I notice a singular circumstance connected with the Mango Trees in Dum-Dum, Cossipore, and the neighbourhood. These trees which were spared by the Cyclone of 1st November, 1867, are in full leaf, but without a single fruit, whilst those which were prostrated and left in their fallen state have borne full crops.

"It would be an interesting point on which to collect information as it seems to me an indication that fruit crops might be greatly increased by judicious root-pruning.

"My own idea is that the fruit crop has been improved by the strain on the roots of fallen trees, and a consequent diminution of the sap, whilst those trees which stood the wind, lost their leaves, and immediately put forth a fresh effort and got into a growing state in an unnatural season."

Mr. Jennings said, in connexion with the note just read, that a short time ago a friend of his had found in an old Almanac, a plan for causing old Mango trees to recommence bearing. It was to dig a deep hole at the roots in the month of January, and after pouring in a quantity of water to refill with the original soil. Such trees are sure to bear full crops. His friend had a very old tree which, within the recollection of his people, had never borne fruit, so he tried the experiment upon it last year, with complete success. This result he (Mr. J.) believed was more due to the cutting of the root in digging the hole than the watering.

Mr. John Scott, Curator of the Royal Botanic Gardens, having been requested to express his opinion on the above subject, said, he had no doubt but that the straining and breaking of the roots of the Mango trees in question had answered a purpose similar to ordinary root-pruning, by which, as is well known, fruit gardeners arrest an over luxuriant growth of branches, and render a thus barren tree fruitful. Mr. Scott also offered a few more remarks in reference to certain other trees which had been prostrated in the Botanic Gardens.

[Since the Meeting was held Mr. Scott has, at the request of the Secretary, added the following further observations on the above interesting question, which it is deemed desirable to introduce here, to make the subject more complete.]

"The results noted by Mr. Jennings, at the Meeting held on Wednesday last, in respect to the increased productiveness of certain Mango trees, seem most exceptional. At least none such have come under my observation, nor can I hear of any from the various parties of whom I have enquired. On the other hand, though I have failed to observe any connection between the prostration of the Mango trees and their productiveness, I have had very clear demonstrations of the relations between the latter and the loss or retainment of the leaves, and this not alone in the Mango, but in many other fruit and forest trees in and around the Botanic Gardens. The fertilising influence which I had naturally expected to result from that rude root-pruning seems to me to have been entirely neutralized by the defoliation of the trees, and the concomitant strain from the gale-force, inducing a spring-like vegetative activity. (In thus co-relating vegetative activity and mechanical strain it will be observed that I adopt the views of Herbert Spencer,—or rather of Mr. Knight,—as shown by his paper in the Philosophical Transactions for 1803, and of which Mr. Spencer, judging from his silence, must have been ignorant when writing his paper "on Circulation and the Formation of wood in plants"—*vide* "Transactions of the Linn. Soc. Vol. XXV.) These phenomena interested me much, and I noted carefully (and still do, as many of the trees have not yet attained their normal-periodic-equilibrium) their peculiar localizations. on a single tree might be seen branches utterly denuded of leaves, others partially so, while there were again others (on the sheltered side) in full verdance. The latter, as before the Cyclone, continued all but dormant; while in others vegetative activity was clearly regulated by the greater or less loss of leaves; attaining its *acmè* in the completely defoliated. The most casual observer could not but be struck with the appearance of these trees branches here covered with the youthful verdure of the developing shoots, and there retaining their older russety verdance, but vegetating not at all, presenting a contrast similar to that resulting from the introduction of a shoot or branch of a plant to a heated house while the others remained in a cold atmosphere. Heat in the latter case effecting what mechanical strain did in the other. In view of an objection which has been raised to the latter action—as a *vera causa* of circulation and growth—from the result of trees defoliated by locusts, &c, I will here confine myself to the remark that in the cases noted, the trees were defoliated in their season of growth while those referred to by me were in their winter dormancy, and that furthermore on two branches of a Mahogany and Banyan tree, which retained their leaves, I made the experiment of defoliating them with a knife, and found that they continued leafless until the adjoining branches had naturally shed their leaves, and been replaced with new ones. It is thus clear that the mere absence of the leaves will not disturb the normal dormancy of these plants Reflecting, then, on the facts as they stand, I fail to see an alternative to the admission of mechanical strain as the vital stimulus The further illustration and discussion of these and cognate phenomena, however, I must needs reserve for the present; and return to the question more immediately at issue. With reference to this, then, I can only say, that the Mango trees in the Botanic Gardens have by no means responded to a fertilising influence in the storm; the great majority are fruitless and the fruit-bearing are so only on those branches which were sheltered from, and undefoliated by the storm. I have made similar observations on the plants in the Botanic Gardens of the following fruit-trees,—*Chulta*, Dillenia speciosa, *Toomu*, Xanthochymus pictorius, *Sweet-sop*, Anona reticulata; *Lichee*, Nephelium Lichi; *Longan*, Nephelium Longan; (and very markedly so) on the *Rose-apple* and *Jamrool*, Eugenia vulgaris and E. alba. With scarcely an exception, all the defoliated branches of these plants were barren, and this holds alike in those which have withstood and succumbed to the storm. As I have already stated, however, I am by no means of opinion that these results in any way disprove the good that may be derived by the root-pruning of Mango trees; though, in a country like this, subject to severe storms, root-pruning will evidently ever be a last resource. (It is noteworthy that the operation and results are well known to the natives of Bengal, though the practice, I believe, is chiefly confined to the Betel and Cocoanut Palms and on these they are careful to cut none of the original, or basal roots, but confine their prunings to the adventitious, or those roots which are given off from the stem above the surface of the soil) I may, therefore, recommend, as a substitute for root-pruning, the ringing of the branches or larger roots, which has much the same effect on the part operated on The process is simple, and may be done either by taking off one or more narrow rings of bark, or by binding the part firmly with a piece of wire, so as to impede the circulation of the sap, decrease the growth of branches, and give an impetus to the organs of fructification."

Mr. Jennings said that perhaps s[illegible] the Members would remember [illegible]ge plant of *Dendrobium calceolare*, which he had exhibited in full flower this time last year, and upon which Dr Anderson had written an interesting note. This plant was thrown over during the Cyclone of November, and the pot broken. He had some difficulty in obtaining a pot of sufficient size, so placed it in one corner of his house, where it was left exposed to the full sun without any moss or soil of any kind. Observing that the plant was covered with buds, it had been left alone, and was now in flower more abundantly than when last exhibited. It was, however, too large to bring to town. Another *Dendrobium calceolare*, which had been potted and cared for in the most approved manner, and sheltered inside the Orchid house, has not borne a single flower. He thought that the same cause *viz*, a check to the circulation of the sap, had caused the abundant flower in the case of the Orchid as with the Mango trees.

Possibly a few experiments in root-pruning would lead to a greater certainty of the Mango crop,—it was worth the trial.

Exhibition of Plants.

The following plants were submitted for competition.—

From Rajah Sutt Shurn Ghosal's garden—7 plants of *Caladia* of sorts, 2 of *Begonia*, 6 Ferns of sorts, including a fine plant of *Davallia elegans*, to which 5 marks were awarded, 2 of *Ærides odorata*, in flower, and 2 of *Ærides roseum*, in flower,—4 marks were awarded to the latter.

From Mr. S. Jennings.—A plant of *Maxillaria squalens* (?) in flower, a novelty;—6 marks awarded.

From the Royal Botanic Garden, for exhibition only.—A plant (new) of *Oncidium* species, in flower.

From the Society's Garden, for exhibition.—6 Ferns of sorts, 2 plants of *Galphimia nitida*, in flower for the first time, and a plant of Manihot (?) species from Dr. Hildebrand, from Honolulu.

Communications were also read :—

From A. H Mowbray, Esq., intimating the theft from his garden, on the night of the 19th instant, of a plant of *Phalænopsis amabilis*, and two fine specimens of *P. Schilleriana*, and expressing the hope that if offered for sale to any one, the person be given into custody The scarcity of *P. Schilleriana*, would make his plants easy of identification as there are, Mr. Mowbray observes, only 4 or 5 specimens in Calcutta at the present time.

Resolved—that the offer of a reward of Rs. 200, made in January last, be immediately renewed to any person who may give sufficient evidence to lead to the conviction of the guilty party or parties.

From Dr. T. Anderson, returning thanks for the gift of the specimens of dried plants collected by Mr Masters in Assam, and recently presented to the Herbarium of the Royal Botanic Garden.

From Messrs. Law, Somner & Co., Melbourne, acknowledging receipt of annual order for seeds of field crops, and promising it their best attention.

From Messrs. Vilmorin, Andrieux & Co , Paris, advising despatch of Society's order for vegetable and flower seeds, with the following remarks respecting a particular variety of Indian corn .—

"You will also find in box No. 6, a collection of flower and vegetable seeds, which we recommend for a trial in your gardens , also a package of Mais Cuzco; this is one of the most interesting varieties we ever have seen, its grain is as large as a good sized bean, containing almost nothing but a pure flour, it grows to an unusual height, but notwithstanding all our endeavours we have not yet been able to find a spot where it might ripen its seeds in Italy as well as in Algeria and Spain. It has failed in Egypt too, the seeds did not ripen. We should recommend it to your special attention, and as the male flowers come out earlier than the female ones, we should think you would do well to plant in rows, wide enough to plant between each row ; another one about 8 or 10 days after the first having been planted; thus the male flowers of one plant might fecundate the female flowers of the other ones. We think you ought to be able to grow it well and cheap, and as it would be an excellent plant to grow for green forage, we might in some years get it from India instead of from Perou, where, owing to the laziness and ignorance of the inhabitants, it can only be procured in small quantities It is grown near the town of Cuzco in Perou in not a very hot district, but where the warmth lasts a very long time."

For the above communications and contributions the best thanks of the Society were accorded.

(*Wednesday, the 17th June* 1868.)

J. A CRAWFORD, ESQ., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen, proposed at the last Meeting, were elected Members:—

Messrs. Charles Chambers, W. J. H. Wagentrieber, C. H. Barnes, H. C. Barstow, Major-General H. Rigby, His Highness Inchi Wan Aboobucker Sree, Moharajah of Johore, K. C. S. I., and Rajah Rughoonundun Singh.

The names of the following Gentlemen were submitted as candidates for election:—

Major W. Delano, R H.A, Mean Meer,—proposed by Colonel John Eliot, seconded by the Secretary.

J. P. Thomas, Esq, Merchant, Calcutta,—proposed by Mr. T. H. Wordie, seconded by Mr. A. H. Mowbray.

Dr. Wm. Craddock (1st Goorka Regiment), Dhurmsalla,—proposed by Colonel Charles Prior, seconded by the Secretary.

Lieutenant W. Hopkinson, Assistant-Commissioner, Maunbhoom,—proposed by Captain R. Money, seconded by the Secretary.

Baboo Peary Mohun Banergee, Pleader, High Court, N. W. P., Agra,—proposed by the Hon. R. Spankie, seconded by the Secretary.

M. Leibert, Esq., Tea Planter, Hazareebaugh,—proposed by Mr. W. Stalkartt, seconded by Mr. W. Haworth.

Captain R. M. Skinner, District Superintendent Police, Shillong, Cossya Hills,—proposed by the Secretary, seconded by the President.

W. B. Rochfort, Esq., District Superintendent Police, Hooghly,—proposed by Mr. C. S. Turnbull, seconded by the Secretary.

Bernard Howard, Esq., Merchant, Mirzapore,—proposed by Mr. W. Judge, seconded by the Secretary.

The following contributions were announced:—

1.—Journal of the Asiatic Society of Bengal, part 2, No. 3, 1867, and Part 2, No. 1, 1868,—from the Society.

2.—Select Papers of the Agricultural and Horticultural Society of the Punjab, from its commencement, 1862 (one volume),—from the Society.

3.—A quantity of acclimatized cauliflower seed from Umritsur,—from H. Cope, Esq.

4.—An assortment of vegetable and flower seeds, acclimatized in the garden of the Agricultural and Horticultural Society of the Punjab,—from the Society.

EXHIBITION OF PLANTS.

The following plants were submitted for competition. From Mr. John Lynam's garden, a plant of *Saccolabium Blumei* and one of *Ærides affine, Var.*—

From Mr. A. H. Mowbray's garden,—a well grown plant in full flower, of *Ærides Lobbei*, and a plant of *Caladium Houlettu.*

It was agreed to refer these to Mr. John Scott for examination, and to bring up again at next Meeting for marks.

GRANT TESTIMONIAL.

The Secretary read the following report of the Special Committee of the Council on the above subject.—

"We, the undersigned, in compliance with the resolution passed at the last Meeting of the Council, duly met on the 29th ultimo, to take into consideration the question of the Grant Medal, and having carefully discussed the various suggestions of the individual Members of the Council, as expressed in the Circular annexed, beg to make the following recommendations:—

First.—That the Medal be of gold.

Second.—That it be in the gift of the Council of the Society at their Annual Meeting,' subject to confirmation at the following Monthly General Meeting of Members, or, in other words, the Annual General Meeting of the Society.

Third.—That the award shall not be limited to the recognition of any particular class of contributions, but shall be made for any real service done to Indian Agriculture, Horticulture, or Floriculture, or any other matter properly falling within the scope and objects of the Society, which the Council may consider deserving of a special mark of commendation.

Fourth.—That the Medal may be awarded to any one whether resident in or out of India, whether a Member of the Society or not.

"In rejecting the proposition that a number of Silver Medals be awarded specially for field produce, &c, your Council felt that such a worthy object might well be added to the list for general competition for the Society's ordinary Medals, and would suggest that in future exhibitions a certain amount be set apart for such purpose.

"Your Committee, bearing in mind that the object for which the fund was originally contributed, namely, to perpetuate the memory of the late Sir John Peter Grant, as President of the Society, feel that, by distributing a number of small Medals, that object would not be so worthily accomplished as by the award of a single Gold Medal, which would be a prize not only more honorable to win, but one that would be worthy both of the Society, and of the distinguished services for which they would be presented. The plan is that usually adopted by the learned and scientific Societies of England."

SAMUEL JENNINGS.
S. H. ROBINSON.
PEARY CHAND MITTRA.

METCALFE HALL, CALCUTTA,
June 2nd 1868.

The Secretary mentioned that the sum originally subscribed in 1848 for a picture of the late Sir John Peter Grant was Rs. 1,800, which has now been doubled by interest. As a picture was not obtainable, it was agreed, by consent of the subscribers, to substitute a Medal. After payment for the die, prepared by Messrs. Wyon, there is now a balance of Rs. 2,700 in Government Securities, the interest on which will meet the cost of a Gold Medal annually. (Previous discussions on this subject will be found in the proceedings of March 1865.)

Resolved,—that the Report of the Special Committee be confirmed.

ARRACAN COTTON.

Read the following letter from the Superintendent of Hill Tracts, Northern Arracan, to the address of the Superintendent, Royal Botanic Gardens, Calcutta, and submitted the sample therein referred to :—

"I have the honor to inform you that, pursuant to instructions received from the Commissioner of Arracan, I have this day despatched per banghy dâk to your address, a parcel containing a small quantity of the cotton grown in the hill district of Northern Arracan. I am unable to state positively whether this cotton is indigenous to the hills of Northern Arracan or not, but it appears that it is, as the natives state that it has been cultivated there from time immemorial. It is cultivated by all the hill tribes in their "toungyas" or hill clearings with paddy, and used by the tribes in the interior for manufacturing their wearing apparel, and very superior robes or wrappers, which are sold to the tribes residing nearer the plains at rather a high price, whilst the tribes residing near the plains either sell their cotton or barter it for other goods to the Arracanese traders. The seed of this cotton is sown either broadcast or put into holes made with a knife, along with paddy, about the beginning of May, immediately after the clearings have been burnt, and without any further trouble the cotton becomes ready to be picked in November and December, at the same time or a little after the ripening of the paddy.

"The Khoormoes, Mros, Annoos and Khongs, which are tribes residing on the Koladan river, cultivate this cotton regularly for sale to the people of the Akyab district. The hill cotton, after being picked, is packed very neatly in drum-shaped baskets made of bamboo, and each basket contains about 30 seers of cotton, and is sold in the hills at from Rs. 2-8 to Rs. 3. The price at Akyab is from Rs. 3 to Rs. 5 per basket, and it is bought principally by the Arracanese for manufacturing their wearing apparel, and a small quantity is exported occasionally to Calcutta by the Arracanese traders. The plant is an annual, growing to the height of three or four feet, and seems to yield a good crop. There is no doubt that the cotton would be much improved if the hill people took the trouble to weed their plantations during the rains, or even sow the cotton separately from the paddy."

BLIGHT IN THE TEA GARDENS OF UPPER ASSAM.

Read the following extract of a letter from Mr. S. E. Peal, of Seebsaugor, Upper Assam, dated 26th May, on the above important subject, and submitted the diseased leaves therein referred to —

"I take the liberty of enclosing some leaves of Tea that have been attacked by a kind of white blister. This disease is so common about here just now, that it might be called an epidemic. It attacks *young* leaf, and is injurious, inasmuch as it stops the bush to a great extent in giving leaf. I have noticed it, sparingly, for some years, and have not been able to ascertain the cause, but I apprehend it is a Fungus "smut or rust," and not caused by any insect.

It is chiefly confined to the leaves, but is also seen occasionally on the *green* part of a stem, or the *green* husk of the seed. When fresh, it presents the appearance of a pale green spot (usually pitted) on the upper surface of the leaf, and on the lower surface is seen as a raised white blister-like spot with a floury or mealy texture, usually circular. The diseased portion eventually turns a brownish color, and the leaf, wholly or in part, dies.

So far it seems peculiar to Tea. I have searched for it in vain on other plants, and it seems to attack it under all circumstances alike, equally so in the open as under shade, in jungle or in clear and highly-cultivated patches; this, at least, is my experience so far; varieties of Tea, including the 'China,' seem to suffer less than those more nearly allied to Assam. I have reason to believe that this disease shows chiefly after long heavy rains. I had heard so before, and this year would seem to confirm the supposition, the rain-fall during April having been very heavy. A patch of Tea near here, of 20 acres or more, has been so generally attacked by this disease, that I have ceased to pluck it, and the garden in places presents quite a withered appearance. Other gardens around are also suffering, the disease being if anything on the *increase*. I have heard that about ten years ago the Tea suffered severely from this same blight, but that the following season it all but disappeared. It will certainly have a marked effect on all the estimates of 'crop,' as it seems to check leaf coming out."

The Secretary remarked that the disease appeared identical with that which caused so much damage last year in certain gardens in Cachar, but, unlike Mr. Peal's experience, it attacked the China plants principally, while the Hybrid suffered but partially, and the Indigenous was scarcely affected at all.

CHENOPODIUM QUINOA.

Read a letter from Mr. P. T. Carnegy, Deputy-Commissioner, Shillong, acknowledging receipt of a packet of seed of *Chenopodium Quinoa* sent him last month, and promising to give it his best attention, and to communicate the result in due course.

In connection with the above, the Secretary read the following extract of a letter from Dr. Anderson (just received), dated from Darjeeling, 14th June:—

"I have sown the Quinoa seed at 4 different elevations, and at all it germinated well, but it does not stand the rain at all well, and much of it has died off after growing a couple of inches. Still many plants remain, and are now withstanding the heavy rains which have set in. I have kept a quantity of seed for cold weather sowing. I have also distributed some of the seed, and from the seed I hope to get from the plants now germinating, there ought to be a good supply for distributing in the cold season. The plant, so far as I can judge from the young seedlings, is very like a *Chenopodium* grown here under the name *C. giganteum*, which I gave it (correctly I believe), and whose leaves the natives cook like spinach. I shall let you know the result of this first sowing when the plants are further advanced."

MONEY GRANT FROM THE GOVERNMENT OF INDIA FOR RESUMPTION OF THE GARDEN IN THE OCCUPATION OF THE SOCIETY.

The following communication from the Government of Bengal was next submitted :—

No. 2341.

GOVERNMENT OF INDIA.—FINANCIAL DEPARTMENT.

Expenditure.

EDUCATION, SCIENCE, AND ART.

Fort William, the 30th April 1868.

Read again :—

Financial Resolution No. 881, dated 18th June, 1867, negativing a recommendation of the Government of Bengal that the Agricultural and Horticultural Society, Calcutta, might be allowed Rs 10,000 and a strip of land on the banks of Tolly's Nullah as compensation for what they have expended on land in the Botanical Garden which they have had to vacate, and deciding that the Society may fairly claim to be reimbursed for the permanent improvements which they have made in the land, which improvements are valued by Dr. Anderson at Rs. 6,068.

Read—The Home Department's Endorsement No. 613, dated 8th February 1868, on a letter from the Government of Bengal, submitting details of the expenditure incurred by the Society on works of permanent improvement on the land recently resumed by the Society, and recommending the grant of Rs. 12,000 as a fair compensation for the value of the improvements :

RESOLUTION.—The Governor-General in Council authorises the payment to the Society of Rs. 12,000 instead of Rs. 6,068, as previously sanctioned on the incorrect estimate of Dr. Anderson.

Ordered, that a copy of this Resolution be sent to the Home Department, with the documents received from that Department, and to the Accountant-General, Bengal.

(Sd.) E. H. LUSHINGTON,

Secretary to the Government of India.

No. 2295.

Copy forwarded to the Government of Bengal in reply to letter No. 21, dated the 3rd January last.

HOME DEPARTMENT, SIMLA, } By order.
PUBLIC. } (Sd.) ARTHUR HOWELL,
The 25th May 1868. } *Under-Secretary to the Government of India.*

No. 2817.

Copy forwarded to the Secretary to the Agricultural and Horticultural Society for information.

By order of the Lieut.-Governor of Bengal,
FORT WILLIAM, } H. L. HARRISON,
The 8th June 1868. } *Junior Secretary to the Government of Bengal.*

Resolved,—That the best acknowledgments of the Society be given to the Government of India for the above award.

COMMUNICATIONS ON MISCELLANEOUS SUBJECTS.

The following letters were also read —

1.—From the Rev. T. C. Firminger, London, dated 15th May, returning his grateful acknowledgments for his election as an Honorary Member.

In another communication Mr. Firminger writes :—"I hope if there is anything in which my services can be made of avail to the Society, you will not scruple to let me know, as I have my time on my own hand, and anything I could do for the benefit of the Society and the good objects it promotes would be really a labour of love."

2.—From the Secretary, Board of Revenue, dated 21st May, intimating that a certain quantity of Carolina paddy has been placed at the disposal of the Government of Bengal, and enquiring what arrangements the Society would recommend for its disposal

The Secretary mentioned that, in communication with the Council, he had suggested the localities which seem best adapted for the trial of this grain.

3.—From Capt. J. F. Pogson, in reference to the fibre of the Date leaf:—

"Would you be so kind as to inform me," writes Captain Pogson, "whether any attempt has ever been made in Bengal or elsewhere to prepare a marketable fibre from the common Date leaf?

"A week ago, I perused an article in the *Delhi Gazette*, in which it was stated that some difficulty existed as to the process of cleaning and preparing China grass fibre, and the Rheha, or Rhea, fibre, and that the Chinese had some process for effecting this object with which we English were not acquainted.

"There being neither of these fibres in the green state procurable at this station, it struck me that, for purposes of experiment, a date leaf would answer all purposes, and that if the date leaf gave a clean fibre, the same process applied to Rhee and China grass would yield similar results

"I enclose a small sample of the date leaf fibre, in order to ascertain from you whether it is likely to come of use for ropes, canvas, gunny, &c., either alone or along with Jute. It seems very strong, a single fibre tried by me bore the weight of five rupees (950 grains) without breaking, but on swinging the weight pendulum fashion, it (the fibre) broke. It had previously been swung with a weight of 600 grains without breaking.

"I think the very fine short fibre which forms the outer covering of the leaf will produce a good paper pulp. I am now trying a cheap and very simple process for getting rid of the green vegetable matter, and this done, a small child could clear the fibre of extraneous matter."

The Secretary mentioned that the sample of fibre was too minute to enable a decided opinion to be formed, but it seemed to Mr. Stalkartt and himself too weak for general purposes. He had informed Captain Pogson that the Chinese process of preparing their so-called "grass," was the same slow mode as that adopted by the Assamese for obtaining the fibre from the Rheea.

4.—From J. C. Wilson, Esq., Canterbury, New Zealand, applying for seeds of certain kinds of Rhododendron and for Tea seed, and promising to send seed of the New Zealand flax *(Phormium tenax)*.

The Secretary mentioned that this application had come too late for Tea seed, but he had been able, through the kindness of Dr. Anderson, to meet the request for Rhododendron seed.

5.—From Baboo Bhoyrub Chunder Potter of Gurbeta, in respect to certain Cocoons of a wild silk yielder *(Cricula trifenestrata ?)*, and requesting the Society to communicate, on his behalf, with the Government of Bengal on the subject.

The Secretary stated that as this was not a discovery of the Baboo's (as he surmised) and as the subject had been several times previously before the Society, the Council did not deem it necessary to act on the writer's suggestion.

Letters were also placed on the table from Messrs. James Carter & Co., of London; Vilmorin Andrieux & Co., of Paris, and D. Landreth and Sons, of Philadelphia, advising the despatch of their respective consignments of seeds. The two former by the *Leicester*, and the latter by the *Kirkham*.

The Council reported that they had granted the Secretary three months' sick leave of absence.

For the above communications and presentations, the best thanks of the Society were accorded.

Wednesday, the 15th July 1868.

J. A. Crawford, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen proposed at the Meeting of the 17th ultimo, were elected Members.—

Major W. Delane, R.H.A., J. P. Thomas, Esq., Dr. W. Craddock, Lieut. W. Hopkinson, Baboo Peary Mohun Banerjee, M. Lebert, Esq., Captain R. M. Skinner, W. B. Rochfort, Esq., and Bernard Howard, Esq.

PRESENTATION OF ADDRESS TO THE LATE PRESIDENT.

The Officiating Secretary intimated that, pursuant to the Resolution passed at the Meeting in January last, that an address be presented to Mr. Arthur Grote, and that he be elected an Honorary Member, a Special Meeting was convened in the Society's rooms on Friday the 3rd instant, at 10½ A.M., when the following proceedings took place.—

The President read the address as under, prefaced by the following remarks from himself:—

Mr. Grote; As your successor for the time being in the Presidentship of this Society, which you have so ably filled for many years past, it devolves on me to give expression on the part of the Society to the feelings of regret with which they regard the close of your active connection with its affairs,—feelings of regret which are, however, mingled with those of pleasure, that you are so shortly to revisit your native land, where we trust you may be spared for many years to come to enjoy yourself in those scientific pursuits so congenial to your tastes. I will not detain you longer, but will proceed to read the address which has been voted to you by the Society.

"To
ARTHUR GROTE, Esq.

SIR,

"ON your resignation of the Presidentship of this Society in January last, we were made aware of the loss which we were about to sustain by your departure from India. Now that the time for your departure is at hand, we cannot permit you to quit the shores of this land, to whose interests so many of the best years of your life have been devoted, without placing on record our sense of the services rendered by you to the Society for the last 17 years, and more particularly for the past 7 years, during which you have filled the office of President.

In an address of this nature it would be out of place to enter into detail on the various subjects, more or less important, which have engaged the attention of the Society. We feel bound, however, to record our conviction that much of the success of the Society has been owing to the zeal, ability, and tact with which you have always advocated its claims;—that to your intimate knowledge of its affairs, and devotion to its best interests, may be, in a great measure, attributed the continuance of its prosperity, whilst the unvarying courtesy and impartiality which have marked your tenure of office as President, have tended to promote amongst its Members that harmony of action, which is so essential to success in such institutions as our Society, by securing for yourself their cordial co-operation.

We beg to hand you copy of the Resolution passed on the occasion of your resigning the President's Chair, as well as of the Resolution by which you have been elected an Honorary Member of our Society. In conclusion, we wish you all health and happiness in your native land, and bid you in the name of the Society, heartily farewell."

Resolution of the Council.—The Council cannot accept the resignation of Mr. Grote as President of the Society, without placing on record their deep regret that his approaching departure from India renders such a step necessary. The Council consider it due to record their sense of the untiring zeal and ability he has brought to bear on the various subjects, which have come before the Society during the period of his President-ship, extending over seven years. The Council are fully aware that they are anticipating the wish of the Society at large in proposing, at the next General Meeting, the nomination of Mr. Grote as an Honorary Member, and an appropriate address previous to his departure for England.

Resolution of the General Meeting.—That this Meeting desire to place on record their sense of the very valuable services rendered to the Society by Mr. Grote, who now vacates the Presidential Chair, and that this Meeting cordially approve of the suggestion of the Council to present him a suitable address, and to elect him an Honorary Member.

Mr Grote returned thanks in the following words —

"I feel very sensibly the honor you are conferring on me in thus assembling to bid me farewell, and presenting this Address to me. I wish I could equally feel assured that my services to our Society deserved to be spoken of in the high terms of favor and approbation which your President has just read, and which he has prefaced by such kind remarks from himself. It was in the early part of a long official life, which has just closed, that I first joined the Society, though it is only since I came to reside at the Presidency, that I have been able to take an active share in administering its affairs. It is, indeed, gratifying to me to find that those of you whom I see present,—and among whom I observe so many of my late colleagues on the Society's Council,—are ready to give me credit for successful efforts on the Society's behalf.

"The Society have it in their power to give important aid to the Government in promoting agricultural enterprise in India, and it will never, I hope, be backward in lending its co-operation in all public measures for improving the material condition of the agricultural classes. The Society's influence will, I think, be greater in proportion as it maintains its independence, financially, of the Government.

"In placing me on your list of Honorary Members, the Society have associated me with many distinguished names, and I shall gratefully occupy a position which will maintain my connection with my old friends and fellow-workmen in this country, and in which I shall still, perhaps, be able to help in advancing the Society's interests."

The names of the following gentlemen were submitted as candidates.—

A. H. James, Esq., Assistant Commissioner, Naga Hills, Assam—proposed by Mr F. Beaufort, seconded by Dr. Charles Palmer.

G. M. Currie, Esq., Civil Service, Cuttack—proposed by Mr. E. Molony, seconded by Mr. W. C. Taylor.

Major T E Tennant, Deputy-Inspector-General of Police, Waltair, Vizagapatam—proposed by Mr. C. W. Voss, seconded by the Officiating Secretary.

Colonel G. E. Voyle, R.A.—proposed by Colonel Arthur Broome, seconded by the Officiating Secretary.

The Secretary Port Canning Company Limited, Calcutta—proposed by Baboo Peary Chand Mitter, seconded by the Officiating Secretary.

T. M. Russell, Esq, Merchant, Calcutta—proposed by Mr Samuel Jennings, seconded by Mr. A. H Blechynden

J. Cave Orr, Esq, Solicitor—proposed by Mr. J G Meugens, seconded by Mr. W. Stalkartt.

Dr. Thos. Hastings, Officiating Deputy-Inspector-General of Hospitals, Lahore Circle—proposed by Colonel John Eliot, seconded by Mr. J. A. Crawford.

T. F. Peppe, Esq, Merchant, Gya—proposed by Mr. E. C Craster, seconded by the Officiating Secretary.

A. L. Clay, Esq., C.S., Deputy-Commissioner of Manbhoom—proposed by Mr Frederick Wilcox, seconded by Mr J. A. Crawford

Syooddeen Ahmud Allie Khan Bahadoor, Nawab of Mooradabad—proposed by Baboo Peary Chand Mitter, seconded by the Officiating Secretary.

CONTRIBUTIONS.

The following contributions were announced:—

1. Records of the Geological Survey of India, Vol. 1., Part 1., 1868 (3 copies) —from the Superintendent.

2. Annual Report of the Geological Survey of India, and of the Museum of Geology, Calcutta, 12th year, 1867,—from the Superintendent.

3. Memoirs of the Geological Survey of India, *Palæontologia Indica*—from the Superintendent.

4. Proceedings of the Asiatic Society of Bengal, No. VI —June 1868,—from the Society.

5. Journal of the Asiatic Society of Bengal, Part 1, No. 3, 1867,—from the Society.

6. Journal of the Asiatic Society of Bengal, extra number,—from the Society.

7. Proceedings of Meetings of the Committee of the Agri-Horticultural Society of Madras, held in the months of April and May 1868,—from the Secretary.

8. Papers and Proceedings of the Agri-Horticultural Society of the Punjab, from May till December 1867,—from the Secretary.

9. Report of the Committee of the Bengal Chamber of Commerce, from 1st November 1867 to 30th April 1868, from the Secretary.

10. Report of the Committee of the Landholders' and Commercial Association, from January to December 1867,—from the Secretary.

11. Report on the Police of the Town of Calcutta and its Suburbs for 1867,—from the Government of Bengal.

12. Résumés des Conférences Agricoles faites au champ d'experiences de Vincennes pendant la saison de 1864, par M. Georges Ville,—presented by Monsr. N. Rondot, of Paris.

The Officiating Secretary stated, that the subject-matter of this small but valuable work in connection with M. Ville's system of "Chemical Fertilisers," was brought to the notice of the Society, about two years ago, by Messrs Thomson and Mylne, Managers of the Jugdispore Estate at Beheea, accompanied by an English version of one of M. Ville's works.

The following is copy of M. Rondot's communication, which accompanied the presentation of the recent French work:—

"J'ai vu, dans une de dernières publications de la Société,* qu'il a été question dans une de sa séances du engrais chimique de M. Ville et du système de culture qu'il a fondé sur leur emploi.

"Le système de M. Ville a des partisans et des détracteurs très-passionnés, et il attiré aujour d'hui l'attention sérieuse de presque tous nos cultivateurs, tant en France que dans les Colonies Françaises. Il est certain que plusieurs cultivateurs qui font emploi dans leur culture des procedés et du engrais recommandés par M. Ville ont obtenu des résultats très remarquables.

"Les Journeaux Agricoles signalent au faits, et les discutent. M. Ville a publié un petit livre intitulé "La Engrais Chimique," dans lequel il expose ses idées et sa méthode, et je ne doute pas que vous ne soyez au courant de sa débats.

"Mais j'ai pensé que vous seriez aise d'avoir un petit livre, devenu rare, et qui donne le résumé des conférances agricoles de M. Ville, de celles qui sont réputées les plus importantes. Ce petit livre présente un exposé suffisamment complet de le système, et sera lu par vous, je l'espère, avec intérêt.

"J'ai prié Messieurs Grindlay & Co. de vous faire parvenû ce livre, que je prends la liberté d'offrir à la Société, attendu qu'il n'a pas mis en vente.

"Si la Société avait l'intention d'établir des champs d'expérience, à fin de juger du mérite de ce système comparativement au système de fumure usité dans l'Inde, je ne doute pas que M. Ville ne fût disposé à donner sa conseils à la Société et à correspondre avec elle à ce sujèt, et je me chargerais volontiers de lui demandre ce service."

13. Catalogue of Prizes to be given at the Bangalore Horticultural Exhibition in February [illegible],—from the Secretary.

14. A Selection of books and pamphlets, principally on agricultural subjects,—presented by Mr. William Haworth on leaving India for England.

15. Two bags of New Orleans, and two bags of Hingunghat Cotton seed, the former sent out by the Cotton Supply Association, Manchester, and the latter from the Cotton Commissioner, Central Provinces and the Berars, together with 14 copies

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* Proceedings for August 1866, Journal, Vol. xiv, Part iv., page 44.

of a printed paper on the cultivation of the Hingunghat Cotton in Bengal, drawn up by Mr. Rivett-Carnac, the Cotton Commissioner,—from the Government of Bengal through the Officiating Secretary to the Board of Revenue, for distribution among those concerned in the experimental cultivation of Cotton in Bengal.

A copy of the paper was referred to the Committee of Papers.

16. A box containing a varied collection of acclimatised seeds, including two seers of Cauliflower seed from Lucknow,—presented by Dr. E. Bonavia.

17. A further packet of seed of the new Creeper, Fredericka Guillaumi,—from Mr. George Bartlett.

A further supply of acclimatised Cauliflower seed from Umritsur,—from H. Cope, Esq.

A small collection of acclimatised flower and vegetable seeds from Tirhoot,—from C. E. Blechynden, Esq.

The thanks of the Society were accorded for the several presentations.

EXHIBITION OF RARE PLANTS.

The following plants were submitted for competition —

Mr. A. H. Mowbray's garden —*Phaius albus*, *Dendrobium formosum*, *Ærides quinquevulnerum* and *Cypripedium purpuratum*.

Messrs. Lynam and Jennings being appointed Judges, accorded to Mr. Mowbray thirteen marks, as follows —

3 Marks for his Dendrobium; 4 Marks for his Ærides, and 6 Marks for his Cypripedium.

Mr. Jennings said it was worthy of remark that *Phaius albus* was flowering beautifully in the open ground in his garden.

ARRACAN COTTON.

The following is the Report of a Section of the Cotton Committee on the sample of Cotton forwarded by the Superintendent of the Hill Tracts, Northern Arracan, to the Royal Botanic Gardens, Calcutta, and submitted at the last Meeting —

" Clean and free from leaf. Color bright and good. Staple of fair strength, but short, harsh, and adhering strongly to the seed this latter feature appears not to have arisen from immaturity, but to be an undesirable peculiarity of the Cotton. It would probably be found that the cost of cleaning, *i. e.*, of freeing it from the seed, would of itself disqualify it for competition with Bengal, while the loss of weight in that process would also in all probability be heavy. In general appearance the Cotton more nearly resembles China, than any other variety known to me.

R. HENDERSON "

" This sample of Arracan Cotton possesses much of the characteristics of China Cotton, it is white, but harsh in staple, and it will probably be found very troublesome to free from the seed, to which it adheres very firmly. From its similarity to China Cotton, which was used in England during the American War on account of its whiteness and freeness from dirt, but the staple of which was found most unmanageable in spinning, I don't think this Cotton suitable for the European market, and should rather recommend any gentleman who interested himself in Cotton cultivation in Arracan, to introduce an improved quality.

ANDREW STERLING"

COMMUNICATIONS ON VARIOUS SUBJECTS.

From G. J. Wallace, Esq, Calcutta, handing a specimen of the "white thread"—a sort of blight from which some of the Tea plants suffer in Upper Assam;—the disease is little known amongst the Planters; the specimen was obtained from the north side of the Berhampooter, while on a visit to a Planter at a garden near Gola Ghât. Mr. Wallace says, that the substance, resembling a "*white thread*," appears to rise from the root of the Tea plant, and winds round and round every branch, twig, and leaf

From H. Rivett-Carnac, Esq, Cotton Commissioner, Central Provinces and the Berars, handing copy of a printed Memorandum on the Hingunghat Cotton plant

Agreed, to insert this interesting Memorandum in the printed Proceedings for the Society's Journal.

From Edward Karop, Esq—Copy of a letter from F. J. V. Minchin, Esq., to the Editor of *Engineering*, on the subject of his experience, and the result of his experiments of "Robert's Diffusion Process in India," for the manufacture of sugar from the sugar cane.

Ordered, to be inserted in the selections for the Society's Journal.

From Dr. E. B Brown, Secretary Agricultural and Horticultural Society of the Punjab, requesting to be furnished with 1 silver, and 2 bronze Medals for this year, the Punjab Society paying for the same Begs also to be informed if the Society will undertake to advertise and sell more or less 50 copies of the publication, entitled "Selected Papers of the Agricultural Society of the Punjab"

The request for medals to be complied with, and the notice of selected papers available to be inserted in the proceedings.

From S. E Peal, Esq., Seebsaugor, Upper Assam, enclosing a few leaves of a small tree, like tea, and taken for indigenous tea, as it is growing on the same hills as the indigenous tea, and is attacked by a red grub, eating the pith, in precisely the same manner as the tea. Mr. Peal refers to the heavy rains, and encloses the following returns of rain-fall.—

Rain Fall, Sapakatee.

June.	Inches.	June.		Inches.	
8	2 30	16		·79	
9	·30	17		·20	
10	·70	18		1 60	
11	·35	19		·63	taken at 9 A M.
12	1·05	"	5·03	2·30	between 2 P. M. & 3-30 P. M.
13	·20	"		1 40	" 3-30 & 4-30
14	·15	"		·70	" 4-30 & 6
15	1 10	21		30	

"The river is so high that almost all communication is stopped. On the 20th the thermometer fell, or rather was below the daily maximum by 10°."

Mr. Peal to be informed that the leaves are not those of the true Tea tree, although belonging probably to the same family.

From J. Gouldhawke, Esq., in reference to Colonel Haughton's remarks on a fancy kind of Tobacco grown at Rungpore, and on Captain Pogson's letter on the Date leaf fibre. Mr Gouldhawke writes as follows :—

"In one of the No.'s of the Agricultural Society's Journal, I see Major Haughton alludes to a kind of Tobacco grown as a fancy article in Rungpore. He described it as having a small dark green leaf, and called by the natives, 'Hamakool.' I was long in Rungpore, and recognise it as the 'Oak leaf tobacco.' The small dark green leaf and yellow flower clearly indicate it. The term 'Hamakool' is applied in derision to every kind of tobacco, except the coarse large leaf, peculiar to the district, and noted for its strength. Even Virginia and Havanna tobacco that I tried to introduce, were dubbed 'Hamakool.'

"The oak leaf tobacco, though rarely grown in Rungpore, is largely cultivated in Purneah, where it is valued for its great strength.

"I may mention also for Captain Pogson's information, that I found *Date fibre* lose its strength by being kept It is strong only when fresh. I may here mention as a curious fact that the fibre of the wild sago tree (common to Duragessur, Rungpore, and the districts to the east), is used in interlacing fine bamboo work in making weirs for catching fish. This fibre is like that of the *tall* tree [*Borassus flabelliformis*], with this difference that it can be readily separated. It is as thick as pack-thread, black and glossy; it would answer very well for ornamental basket-work. The fibre of the Date bears no analogy to that of the Rhea, China grass-cloth plant No process of separating the fibre of the one could, I imagine, apply to the other.

"Information as to the best mode of separating the Rhea fibre is most to be desired; should you be able to publish such information it would be valuable indeed. I have the Rhea plant, and its propagation from cuttings is most easy. I can do nothing with it merely for the want of this information Probably many others are in the same dilemma as myself"

From Law, Somner & Co, Melbourne, 23rd May, advising consignment of field seeds being ready, waiting for an opportunity to ship the same for Calcutta.

The Officiating Secretary took the opportunity to mention the arrival of the *Kirkham* with American vegetable seeds, which he hoped to have ready for distribution about the end of the month.

The Officiating Secretary intimated that Mr. Blechynden had availed of the sick leave of absence granted to him, and that he (Mr. Robinson) had agreed to undertake the duties of the office during the Secretary's temporary absence.

The following is the Memorandum from Mr Rivett-Carnac referred to above :—

"As several gentlemen, who are desirous of making experiments in Bengal this season with Hingunghât Cotton seed, have requested me to give them information on certain points regarding the locality and soil in which the Cotton thrives, and the manner of its cultivation, I have drawn up the following brief note which, I hope, may be of some use to those who are inclined to assist in extending the cultivation of this superior class of indigenous Cotton.

"Hingunghât Cotton is grown in the Wurdah district of the Central Provinces, in the neighbourhood of the town of Hingunghât—an important cotton market—from which place the cotton takes its name.

"The cotton is celebrated for its cleanness (freedom from leaf and dirt), brightness of colour, length, strength, evenness, and silkiness of staple. In all these points—all of which are regarded as of great importance by the spinner—the Hingunghât variety is superior to most of the Indian cottons. As compared with the cotton of Bengal, that grown in the Hingunghât country, besides being superior in all the respects noticed above, is particularly glossy and soft, whilst Bengal cotton is woolly and dull in appearance, and rough and harsh to the touch.

"There can be little doubt that the superior quality of this cotton is to be attributed to the physical advantages of the tract in which it is grown. The Wurdah district is situated on the northern extremity of the great Deccan sheet of trap, which extends from Mudnoor—far south in the territory of H. H. the Nizam—to the low hills, which form the northern boundary of the Wurdah district. The height of the cultivated plateau is not more than 900 feet above the sea level. The soil is of the well known '*regur*,' or black cotton soil, composed of the *debris* of the trap rock, the basis of the geological formation of the district. The following description and scientific analysis of this soil is extracted from Ansted's Geology, p 343.—

"'Its colour is bluish-black, greenish, or dark gray It forms into a paste with water, and gives a clayey odour. It absorbs moisture rapidly, and parts with it in dry and hot weather. Its thickness varies from 3 to about 20 feet. It is cultivated very easily, yielding a rotation of crops consisting of cotton and two kinds of corn. It rarely requires to be left fallow, and demands but little husbandry, although for the last 2000 years this soil has continued in cultivation without manure, retaining the utmost fertility.'

"The following is an analysis of the '*Regur*':—

Silica	48·20
Alumina	20·30
Carbonate of Lime	16 00
Carbonate of Magnesia	10 20
Oxide of Iron	1·00
Water and Organic matter	4 30
	100

"In the Hingunghât country this soil varies in depth from 2 to 15 feet, but the average depth of the best cotton-growing lands does not exceed 6 or 8 feet.

Beneath this rich coating, kunker, a sort of hard gravel, is found, and below this again is the trap rock already noticed

"The country slopes gradually southward towards the river Wurdah, which forms the southern boundary of the tract, and as the village lands, following the upheavings of the volcanic crust beneath, lie in huge waves of soil, the direction of which is at right angles to the course of the river, the drainage is excellent, the rain-water being carried off by streams flowing down between the troughs of these waves, and discharging themselves into the Wurdah. The rainfall in the tract is moderate, not exceeding on an average 39 inches. Last season the monsoon was unusually heavy, and very much harm was in consequence caused to the cotton crops.

"It will be seen from the above that the tract in which the cotton is grown possesses two great physical advantages—a good soil and excellent drainage. And of the two, the drainage is, if anything, of even greater importance than the soil. For, although due provision must be made for the tap-root of the plant, which strikes straight down into the ground, it is not necessary that the soil should be more than from 4 to 5 feet deep. Cotton is, of course, often sown in soil the depth of which is not one quarter of the above, but the poorness of the soil tells upon the plant and its produce On the other hand, cotton is apt to be clogged and smothered in the very deep rich soil, and this is one of the reasons, I believe, for the plant not being very extensively cultivated in the Nurbudda Valley, the lands of which are much better adapted for wheat, which is grown in and exported in large quantities from the Nurbudda districts. In the Wurdah district, the deepest soil is to be found in the Mandgaon Pergunnah, and here, too, wheat takes the place of cotton, which the people say thrives better in a lighter soil.

"In selecting the fields for the experimental culture of Hingunghât cotton, I would recommend, then, that particular attention be paid to the drainage of the ground. At the same time, a fair average soil should be allotted to the crop.

"As regards the cultivation, I hardly know the seasons in which cotton is planted in the Bengal Province, or the manner in which the crop is now treated. I am unable, therefore, to offer any suggestions regarding improvements to be made in the present mode of cultivation there. I will, however, mention briefly the method in force in the Hingunghât country, and as that system is sufficiently successful, it would perhaps be well if the gentlemen, who are good enough to make experiments with the Hingunghât seed, were to follow that system, unless their experience suggests that it is not adapted to the circumstances of the country. Where opportunity offers, it would be well to cultivate one field according to the Hingunghât plan, and to treat another in the manner peculiar to the district in which the experiment is made.

"In the Hingunghât country, the cotton is sown during the first break in the weather following the setting in of the rains.* The field selected is generally one that has borne a grain crop the previous year; for, of course, cotton should never be sown two seasons running in the same ground. Previous to the commencement of the monsoon, the ground is prepared for the crop by being ploughed or rather scraped by the "*bukhur*," a rough instrument which is peculiar to this part of the country, and which takes the place of the plough of Eastern India. The *bukhur* is passed over the field five or six times according to circumstances, and has the effect of scraping up and loosening the soil, and preparing it to drink in the rain, which, instead of running off the surface, as on the hard untilled ground, sinks through the loose earth, moistening and softening it, so as to admit of the working of the drill plough, and the commencement of sowing operations. In this part of India, cotton is never sown broadcast, but always in rows, sometimes with the drill-plough, or, when the soil is light, with the aid of the *bukhur* and a bamboo tube, down which the seed is poured, and which serves the part of the feeder in the drill-plough. The seed, from the circumstance of much of the cotton fibre adhering to it, often clogs the feeder, and, to obviate this, the cultivators in this part of the country generally roll the seed in cow-dung or dry earth, which process helps it to run more freely down the tube. I mention this, as the Hingunghât seed may perhaps, without the use of this precaution, give some trouble to the sowers in Bengal. In this part of the country the seed is sown very close, too close together, and the rows are, as a rule, not far enough apart. As, however, the plant is small, and does not branch out, it admits of being more closely packed than many other varieties, but I would recommend that the rows be not less than 2½ to 3 feet apart. Soon after the plant appears above ground, the soil between the rows, which the action of the rain has hardened and caked, is loosened with a sort of hoe, a small edition of the *bukhur*, which fits in between the lines. The young plant is thus helped to push its way above ground, and is now left pretty well to itself until the weeds begin to appear. The weeds should then be carefully removed, the weeding being done by hand, and this process should be repeated sufficiently often to keep the field perfectly free from grass.

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* In some parts of the Chandah district and on the Godavery, a small crop is raised by the Cotton after the rains. It ripens in April.

As the plants progress, care should be taken to thin the field in places where the plants are found to have been sown too close together. In foreign soil the Hingunghât plant has sometimes been found to shoot up very rapidly, and to show a tendency to run to wood. In its own country it is a short, sturdy, little plant, small, seldom more than 3 feet in height, but yielding a good quantity of cotton, (the great point), and when it appears to be outgrowing its strength, it would be well to "top it," by cutting off a few inches from the top of the plant. And too much care cannot be bestowed in following the plan of 'rogueing' the crop, as advocated by Major Trevor Clarke, and thereby ensuring the purity and high quality of the plant. In the Hingunghât country this valuable process has only recently been introduced, and although the seed sent to Bengal and other parts of India has been selected from the best lands, and with considerable care, I cannot too strongly urge the importance of rogueing the crop, and selecting the seed as recommended in Major Trevor Clarke's pamphlet. Spare copies of the pamphlet will be forwarded, but for facility of reference an extract from this valuable paper is here annexed —

"But I must now turn your attention to a fresh subject, already, however, alluded to in my former letters, namely, the use of pure seed, to be effected by the rigid isolation of sorts. Next to a constant supply from any indicated source, the manufacturer requires a *constant quality of staple.* From accounts I have received, from credible eye-witnesses, the mixture of sorts in a cotton-field, especially in the West Indies, is inconceivable, the crop in some instances looking like a flower-garden with different sorts, sizes, and colours. In one case my informant described the not unfrequent appearance of a red blossomed sort, evidently the Indian G. Arboreum, in his fields.

"This is the work of the native labourer, who is either incapable or unwilling to see the difference between right and wrong; at any rate, where his own interests are not concerned His delight seems to be in reversing, confusing, or nullifying especial orders the moment the master's eye is off, and the mixture of seed is generally his preliminary operation. In my own experience I rarely receive unmixed samples, and wrongly named sorts are continually sent home, although probably in good faith, as far as concerns the sender

"The one and only remedy for this will be found in English skill, science, and energy, strongly exerted in this one direction. Experimental farms, at the expense of, or encouraged by, Government, are nothing new; for a century or two these have been carried on in spite of the perversity of man, as well as that of the elements, and have borne their fruit. My modification, however, of the system would be this. *Let such establishments be entirely devoted to seed farming,* the sole effort being restricted to the production of pure seed in the country where it is destined to be grown in future In this country no grower of seed, either for agriculture or gardening purposes, would now obtain a sale for his produce, were he to supply his customers with mixed or inferior seeds. In the establishments of such persons the master himself goes through his crops several times a year, for the purpose of destroying every plant which proves inferior or untrue to sort. This weeding process is technically and expressively called 'rogueing' the crop, and is absolutely necessary to ensure purity and high quality. At the same time, improvement by special selection is carried on: single plants showing high qualities are picked out for propagation, and the produce of these submitted even more rigidly to the same treatment."*

If these instructions be carefully followed, and the produce of the best plants be carefully selected on the pedigree system, and seed-gardens be established and sown with the selected produce, I have little doubt that the introduction of the Hingunghât cotton seed into Bengal will do much good.

The cotton plant begins to flower in September; during the following month the pods form, and in November the capsules burst, and the cotton is ready to be picked. Care should be taken to pick the cotton whilst the plant is yet young and fresh, and before the leaves wither and die and become mixed up with the cotton. Much of the cotton in this part of India is damaged, and suffers in price from the careless manner in which this process is performed.

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* Major Trevor Clarke's "Improvement of Cotton by Purity of Seed," page 3; published by the Cotton Supply Association. September 1866.

The ginning, or the separation of the cotton from the seed, is performed here by the common Native "*Churka*," or "*Recha*," as it is more properly called. Where Platt's Macarthy Gins are at hand, I would recommend that they be used.

It will be noticed that I have not recommended the use of manure. Its use should depend on the circumstances of the soil, and the experience of the cultivators, in that part of India where the experiment is made. What suits Hingunghât land may not be found to answer in Lower Bengal; but I may mention that here the cultivators do not generally manure their cotton-fields They hold that if the rainfall is unusually heavy, manure may be found to answer, but that in their country, where the fall does not exceed 39 inches, manure is apt to excite the plant and drive it to wood, resulting in very fine cotton plants with hardly any cotton! Experiments are being made to test the correctness of this theory. In a new country, I should be glad to see as many experiments as possible tried, and it would be well not only to sow the seed in every sort of soil available, but also to try the effect of the cultivation with and without manure

I would, however, advise all who undertake experiments with this seed, to sow not less than 5 or 6 acres at a time. Any experiment conducted on a smaller scale than this will hardly be satisfactory. On an average from 8 to 10 lbs. of cotton seed are required for an acre, and thus from 50 to 60 lbs. of the seed will suffice for each trial.

Where convenient, I should be glad if not less than 12 lbs. of Kupas (uncleaned cotton) from each field could be forwarded to my address at Nagpore, with a statement showing the result of the experiment.

I need hardly say that I shall be at all times exceedingly glad to answer any questions, and to render any assistance in my power to all who take an interest in the subject.

HARRY RIVETT-CARNAC,

Cotton Commissioner for the Central Provinces and the Berars

Camp Oomraotee, 18*th March* 1868.

Wednesday, the 19*th August*, 1868.

ROY HORRO CHUNDER GHOSE BAHADOOR, *Vice-President, in the Chair.*

Proceedings of the last Meeting were read and confirmed.

ELECTION OF MEMBERS.

The following Gentlemen, proposed at the last Meeting, were elected Ordinary Members —

A. H. James, Esq., G. M. Currie, Esq, Major T. E. Tennant, Colonel

G. E. Voyle, Secretary Port Canning Company Limited, T. M. Russell, Esq., J. Cave Orr, Esq., Dr. Thomas Hastings, T. F. Peppe, Esq., A. L. Clay, Esq., and Syooddeen Ahmad Allie Khan Bahadoor.

CANDIDATES FOR ELECTION.

The names of the following gentlemen were submitted:—

Lieut. C. H. Garbett, Assistant-Commissioner, Manbhoom,—proposed by Mr. Frederick Wilcox, seconded by the Officiating Secretary.

J. C. Banziger, Esq., Merchant, Calcutta,—proposed by Captain C. Burbank, seconded by Captain John Paterson.

W. H. Smith, Esq., Civil Service, Allyghur,—proposed by Mr. C. Nickels, seconded by Mr. R. Tregear.

Dr. G. Banister, F.R.C.S., Governor-General's Body Guard, Derah Dhoon,—proposed by Lieut.-Col. D. Gaussen, seconded by Major G. Delane.

A. F. Patterson, Esq., C.S., Joint-Magistrate, Boolundshuhur,—proposed by Dr. G. B. Hadow, seconded by the Officiating Secretary.

H. H. F. Bertelson, Esq., Tea Planter, Mohurgong, Darjeeling Terai,—proposed by Mr. H. M. Herold, seconded by the Officiating Secretary.

F. V. B. Webber, Esq., Civil Surgeon, Dinagepore,—proposed by Mr. E. V. Westmacott, seconded by the Officiating Secretary.

Major George A. Searle, Madras Staff Corps, Executive Engineer, Irrigation Department, Kishnaghur, proposed by Mr. E. Haldane, seconded by Mr. S. Jennings.

Brigadier-General G. Bourchier, C.B., Royal Artillery, Dinapore,—proposed by Dr. R. F. Hutchinson, seconded by Mr. S. Jennings.

Charles H. Wilson, Esq., Merchant, Calcutta,—proposed by Mr. Joseph Agabeg, seconded by Baboo Peary Chand Mitter.

Lewis Arthur Goodeve, Esq., Barrister, Calcutta,—proposed by Mr. Andrew Sterling, seconded by Mr. A. G. Graham.

W. R. Martin, Esq., Tea-Planter, Punkabaree,—proposed by Mr. H. M. Herold, seconded by the Officiating Secretary.

T. E. Coxhead, Esq., Joint Magistrate, Magoorah,—proposed by Mr. R. F. Stevens, seconded by the Officiating Secretary.

William Young, Esq., Officiating Magistrate and Collector, Boolundshuhur,—proposed by Dr. G. B. Hadow, seconded by the Officiating Secretary.

Henry Leeds, Esq., Conservator of Forests, Bengal,—proposed by Dr. T. Anderson, seconded by the Officiating Secretary.

PORTRAIT OF MR. ARTHUR GROTE FOR THE SOCIETY'S ROOMS.

A recommendation was submitted by the Council that a portrait of the Society's late President, Mr. Grote, be obtained for the Metcalfe Hall. The Asiatic Society having already arranged with Mr. Grote to sit for one in England, the

Council proposed to place the sum of (50) fifty guineas at the disposal of Mr Crawford, the President, who has gone home on leave, with a request to him to obtain a copy by a good artist before the original portrait leaves England.

The recommendation of the Council was cordially agreed to.

CONTRIBUTIONS

The following contributions were announced —

1.—How to make Miniature Pumps and a Fire Engine (a pamphlet,)—presented by A. J. Sturmer, Esq.

2.—Pamphlet on Norton's Patent Tube Well,—presented by Mr. Barter, the sole Licensee

3.—Royal Horticultural Society's Proceedings, Vol. 1, New Series, April to July 1868,—presented by the Society.

4.—Proceedings of Meetings of the Committee of the Agricultural and Horticultural Society of Madras, held in the months of March and June 1868,—from the Secretary.

5.—Annual Report of the Cape of Good Hope Agricultural Society for 1867,—from J. C. Holding, Esq., the Secretary

6.—The culture of the White Mulberry in the Cape Colony,—presented by J. C. Holding, Esq.

7.—Proceedings of the Asiatic Society of Bengal, No. VII, July 1868,—from the Society

8.—Journal of the Asiatic Society of Bengal, Part II, No. 11, 1868,—from the Society

9.—Records of the Geological Survey of India, Vol. I., Part 2, 1868,—from the Superintendent.

10.—A small packet of acclimatized Cauliflower seed from Azimghur,—from A. J. Sturmer, Esq.

11.—A box containing 40 young plants of the *Mesua ferrea* from Moulmain,—presented by Joseph Agabeg, Esq.

12.—Two small tin canisters of a new food, discovered and prepared by Lieutenant J. F. Pogson, Umballah,—presented by the discoverer for experimental trial.

13.—Specimens of the destructive beetle known as the "*Shanko poka*," or "Hispa,"—presented for the Agricultural Society's Museum by R. B. Chapman, Esq

Thanks were accorded for the above contributions.

SILK CULTURE IN THE CAPE COLONY.

Read extract of letter from Mr. J. C. Holding, Secretary, Agricultural and Horticultural Society, Cape of Good Hope, transmitting copy of a pamphlet on the culture of the "Morus Alba" in the Cape Colony, and requesting to be supplied with healthy silk-worms' eggs, with practical hints on the treatment of the worms and mode of reeling adopted in Bengal; and offering to reciprocate in sending supplies of seeds, either indigenous or acclimatized, and information on any subjects in connection with the development of agriculture in South Africa, which may be interesting to the Society.

Agreed, to send a small supply of Bengal silk-worms' eggs, by an early opportunity, packed according to the most approved method.

A NEW FOOD.

Submitted sample of a new food discovered and prepared by Lieutenant J. F. Pogson. The Secretary stated that a tin of it was sent to Dr. Woodford, who was kind enough to say that he would give it a trial, but as that gentleman's report has not yet been received, it was agreed to have the matter brought before the next General Meeting

PERIODICAL REPORTS ON COTTON PROSPECTS.

Read letter from Mr. H. Rivett-Carnac, the Cotton Commissioner, under date 22nd July, offering to send, if desirable, copies of his periodical Reports on the state of the weather and prospects of the Cotton Crop, and asking for any remarks or suggestions from the Society for the improvement of the same.

Agreed, that Mr. Carnac's offer be accepted with thanks, and promise of co-operation

GRASSES OF ASSAM.

Read the following extract of letter from Mr. S. E. Peal, dated Sapakattee, Seebsaugor, Assam —

"I am now illustrating the "Grasses" of Assam, for Dr. Meredith, the Inspector of Coolies up here, drawn from nature and the actual size (as far as possible), and giving the habitat, and find my knowledge of Botany very limited. If you could let me know the name of any *good*, plain work on the above, I should feel much obliged, and also if you think the microscope an *essential*—I mean in drawing the "flowers." I can send you all the *dried* specimens if you wish, but they perhaps are not worth house-room. The most striking feature, so far, is the elasticity of their constitution.

"Ooloo (*Imperata cylindrica* I think) grows and blossoms from 1 foot high to 10 feet, and there are 3 varieties, of Borata, at least 4. The Megella is a splendid reed, often 30 feet high, blossom spike up to 3 feet long—purple.

"Many of the grasses have large and edible seeds, and a patch of "Torga;" that I was carefully growing, has lately been destroyed, it has a very heavy head of seed, like *oats*, and grows, to 8 and 10 feet high; one seed will give about 20 stalks with 300 to 400 seeds in each

"These forests and jungles ought to have something good in them, the *trees* are literally *innumerable*, and the creepers and parasites, large and small, equally so; a square foot of the stem of a Chopper tree will give often 50 or 60 kinds of fungoids, seen as patches or stains; the true bark *never seen*. Water-plants, or of swamps, are equally abundant, the "Torras" alone are a splendid group; the wild Cardamum, one of them, I believe, often 20 to 25 feet high—*square miles* of it in fact, and I have seen, so far, 22 varieties, some with magnificent spikes of orange or purple blossom.

"I have only lately collected Orchids, and have but some seven or eight varieties, and know nothing whatever about them, except that some of them seem *peculiar* to certain trees

"Bon Rhea is very plentiful here. I see there are also two smaller varieties (useless)"

THE WOOD BORING BEE.

Read extracts of letters from Major Ralph Ouseley, dated Roy Barelly, 17th and 31st July 1868, submitting specimen of an insect, which has for some years past occasioned much damage to the young Toon trees Capt. Lang, R. E., at Lucknow, gives the following description of the insect —

"This insect is a solitary wood boring bee of the species "*Ceratina viridis*" "The only English representative of the bee is "*Ceratina cerulea*," said by "Latreille, Le Fargean, and others to be parasitical, *i. e.*, a haunter of the cells "bored by another species, in which, when ready, it lays its eggs and its larvæ, "starves the rightful owner, and eats the bee-bread, and eventually emerges from "the cell as a perfect bee

"The Marquis of Spinola and other observers, have however decided, that "Ceratina is not parasitical, but itself bores the wood, and stocks the cells with "bee-bread"

Major Ouseley writes, that the chief objects of enquiry are, to ascertain whether this insect is in any way related to the destructive coffee-borer, and how it can be most surely destroyed.

The Officiating Secretary reported that the specimen insect, with the decayed stems of the tree, &c, as received from Major Ouseley, were submitted for the opinion of Dr. Stoliczka, who, however, is of opinion, that Capt Lang must have examined an altogether different bee from the one which was previously sent to him, which species Dr Stoliczka writes was certainly not a *Ceratina*, but to all appearance an *Andrena*, the species of which are all solitary bees. Dr. Stoliczka admits he is not acquainted with the species which Capt. Lang calls *Ceratina viridis*, but the specific name *viridis* would be certainly not a very characteristic name for the *Andrena*, which he states was sent to him, and which the Society received from Major Ouseley.

Dr Stoliczka writes that "the *Andrena* usually digs under ground or makes small holes in walls, embankments, &c, laying a number of eggs, which they supply with food The larvæ come out in from four to twelve days; the imago is formed after about 6 or 8 days, and in about the same time more the insect comes out I have not heard that any species of *Andrena*, or allied genus, lay their eggs in fresh branches of trees, though occasionally they make holes for that purpose in old and dry wood, or roll up leaves. In the present case, it appears that the female insect excavates a hollow in the fresh branch of the Toon tree, the central portion being soft marrow, and then lays a number of eggs in it. In which way the larvæ are supplied with food (which usually consists of pollen and honey of wild flowers), would be very interesting to find out. Equally interesting would be an observation how long the larvæ live, or what time they require to the development of the perfect insect. I cannot find that the species has been described. I should not think that the larvæ live on the marrow of the branches; it would be an entirely exceptional case. Still direct observations would be very desirable. It is natural that where there are a large number of those insects, their attacks upon the young branches of the Toon tree soon make themselves apparent.

"I do not see any means how to destroy the larvæ, or eggs, or the full grown insect of the *Andrena*, unless one would destroy the top branches of the tree, or the whole tree The bees lay the eggs single and, probably, in different places. I should not even think that they confine themselves to the Toon-tree only. Any other tree, the twigs of which have a thicker marrow, may be selected by them as the receptacle for habiting their eggs, and with a similar dangerous result. If the plant liable to be attacked by the insect was a shrub, or at least not a tree of a considerable height, and if the time when the insects lay their eggs and bore most eagerly, was perfectly well known from previous observations, the only thing that I could imagine that may be instituted with any success, is smoking the place all over. It would, as I say, only drive the insect away from the plantation, but how to destroy it, seems to be beyond a possibility

"Major Ouseley's inquiries and researches will, no doubt, be very valuable, but I do not think the present insect has much in common with the coffee-borer, for, as far as I have heard of the coffee-boring insect, this seems to be a beetle belonging to the *Bostrychinæ*, and the destroyer is the larvæ."

THE SHANKO POKA, OR HISPA.

Read letter from Dr. F. Stoliczka in identification of the beetle, which occasioned considerable damage to the Rice crops in Jessore, called the "*Shanko Poka,*" specimens of which were submitted to the Society by R. B. Chapman, Esq., Commissioner of the Presidency-Division, with a request for its identity, and the means of extirpating them. The insect is described by Dr. Kenneth McLeod as "a dark brown beetle, one-eighth of an inch long, with two-headed antennæ covered "with hairs, two pairs of legs, one pre-thoracic and one attached to the post-thorax, "one pair of wings, and four distinct abdominal segments; it has on the dorsum "of the thorax a perfectly symmetrical pair of antlers with four branches, behind "these, two spines, also symmetrical, and behind these, two slender hairs, the wing "cover is beautifully marked by a regular series of rows of bright yellow circles, "depressed in the centre, and is covered with spines of varying length and size, "the integument has a beautiful metallic lustre, and the eye-masses are large "and globular, the extremities of the feet are bristled like a hair-brush, and the

Wednesday, the 9th September 1868.

ROY HURRO CHUNDER GHOSE BAHADOOR, *Vice-President, in the Chair.*

ELECTION OF MEMBERS.

The following Gentlemen, proposed at the last Meeting, were elected Ordinary Members —

Lieut. C. H. Garbett; J. C. Banziger, Esq.; W. H. Smith, Esq.; Dr. G. Banister, F.R.C.S.; A. B. Patterson, Esq., H. H. F. Bertelson, Esq.; F. V. B. Webber, Esq.; Major George A. Searle; Brigadier-General G. Bouchier, C.B.; Charles H. Wilson, Esq.; Louis Arthur Goodeve, Esq.; W. R. Martin, Esq.; T. E. Coxhead, Esq.; William Young, Esq.; and Henry Leeds, Esq.

REPORT ON SUNDERBUN COTTON.

The Officiating Secretary submitted a specimen of Cotton grown by Mr. William Swinhoe, without culture, in the Sunderbuns, the product of perennial trees raised from Sea Island seed imported by Mr. Swinhoe, on which the Cotton Committee reported as follows.—

"A very valuable description of Cotton of acclimatised growth staple strong and silky, and possessing all the characteristics of Sea Island, with the exception of length, in which respect it is deficient when compared with the best qualities of original stock. The sample under report is much stained, possibly by exposure to the weather or by careless picking.

"In order to ascertain the actual value of this Cotton, I think it would be necessary to send a larger and more carefully picked sample to England, and have it compared there with the different qualities of Sea Island, and other long stapled varieties of Cotton. As far as I can judge of this quality, as compared with finer samples of Sea Island Cotton, I would be inclined to estimate its present market value at 20*d.* to 2*s.* per lb.

"M. HENDERSON.

"24*th August* 1868."

"A satisfactory specimen of Cotton, showing that, with culture and more care in its management and cleaning, long-stapled Cotton may well be grown in the Sunderbuns.

"The practical question arises, however, in looking at such Cotton, whether, except as a matter of curiosity, it is at all worth while to attend to the cultivation of such a description, the consumption of which is only of a limited nature, as it can only be, and for very fine spinnings; and whether such Cotton, as middling to fair Orleans, is not the most deserving of attention.

"ANDREW STIRLING.

"27*th August* 1868."

"I have always recommended that a large quantity, such as say one hundred maunds, be sent to England of such fine Cotton, as these samples, not only to find out the real market value there, but also, when used, the percentage of produce, in twist realized, in comparison with American Cotton. Here once the Rangoon indigenous was tried with Bandah, and the product of Bandah was eighteen hundred morahs against only twelve hundred of Rangoon. This would be the most practical way of finding out its intrinsic, as well as its commercial value.

"JOSEPH AGABEG."

CANDIDATES FOR ELECTION.

The names of the following Gentlemen were submitted :—

George H. Landale, Esq., Indigo Planter, Maldah,—proposed by Mr W. Cumming, seconded by Mr. H. G. French.

J. B. Worgan, Esq., C. S., Officiating Joint Magistrate and Collector, Purneah, —proposed by Dr. T. Anderson, seconded by Mr. S. Jennings.

George Benson, Esq., Pleader High Court, N. W. P., Bareilly—proposed by Mr. S. Jennings, seconded by Baboo Hurro Chunder Ghose.

Mr. J. A. Cockburn, Superintendent, Park, Barrackpore,—proposed by Mr. Samuel Jennings, seconded by Baboo Peary Chand Mittre.

The Prince Fukeeroodeen, Chinsurah—proposed by Baboo Radha Romun Dutt, seconded by Baboo Hurro Chunder Ghose.

Mr. F. F. Wyman, Publisher, Calcutta—proposed by the Officiating Secretary, seconded by Baboo Hurro Chunder Ghose

CONTRIBUTIONS

The following contributions were announced.—

1.—Journal of the Asiatic Society of Bengal, Part I., No. 1, 1868,—presented by the Society.

2.—Journal of the Asiatic Society of Bengal, Part II., No. 3, 1868,—presented by the Society.

3.—Proceedings of a Meeting of the Agricultural and Horticultural Society of Madras, held on the 1st July 1868,—from the Secretary.

4.—A Box of the new food discovered and prepared by Lieut. J. F. Pogson, being a further supply,—presented by the discoverer for experimental trial.

5.—40 additional printed copies of Memorandum on the Hinganghât Cotton, by Mr. Rivett-Carnac, Cotton Commissioner,—from T. B. Lane, Esq., Officiating Secretary, Board of Revenue, for distribution amongst those concerned in experimental sowings of the said Cotton in Bengal.

6.—Report on the condition of the Royal Botanical Gardens, Calcutta, from 1st April 1867 to 31st March 1868,—presented by Dr. T. Anderson, the Superintendent.

7.—Report of a Meeting of the Agricultural and Horticultural Society of the Punjab, held on the 14th April 1868,—presented by the Secretary.

"mouth furnished with two lateral mandibles; the eggs are laid in a pouch "formed by stripping the cuticle for a short way off a blade of paddy" Dr Stoliczka writes —

"That the beetle in question belongs to a very interesting group of *Coleoptera* (sub-division *Cyclica*) named *Hispa*.

"I cannot say whether the species has been described or not, for we are very short of literature on this branch of natural science, but I certainly have seen the beetle in several collections at home. A few years ago, I have myself sent a large number of them home: they were brought by my collectors from the neighbourhood of Calcutta.

"The present Indian species is clearly distinct from the European *Hispa atra*, so far as my recollection goes. This is considered a rare beetle, has similar spines on the wings as the Indian, but smaller and more numerous, the spines on the thorax are also more numerous, it is also perfectly black, while the Indian species has a distinct greenish metallic lustre.

"*Hispa atra* lives on nettles, and the beetle has the peculiarity to represent himself dead, whenever he is disturbed, he generally drops down from the plant on the ground at any approaching danger.

"The Indian species of *Hispa* has no doubt similar modes of protecting his life, and, I believe, it is so sensible that even a somewhat stronger wind causes it to fall off from the plant on which it usually feeds. The greatest destruction is undoubtedly caused by the larvæ of the insect, which live in the plant.

"So far as my experience goes, there is no other way to diminish the number of insects than to burn down the portion of the crops which are attacked by the beetle. This ought to be done on the entire field itself It would, I think, not be sufficient to collect the plants and burn them on a heap, for, as I said, the beetle does not remain on the plant, but immediately (or at least usually) drops to the ground as often as disturbed. When the ripe ears of the paddy were cut off and the rest burnt down, it may at least prove partially effective and destroy the larger number of *beetles, their larvæ, and eggs*. In this way, and, I believe, the only one, can the next crops be saved from a repetition of the same calamity."

PROPOSED METHOD FOR PREPARING RHEA FIBRE.

Read extract of letter from Lieut. J. F. Pogson, Umballah, dated 11th August 1868, on the subject of the Date and Rhea fibres, as follows:—

"I have read Mr. Gouldhauke's remarks on my paper on Date fibre. I consider the brittleness of Date fibre to be owing to an excess of silica, and the great strength of the Rhea fibre to the absence of silica. Now, to supply Mr. Gouldhawke with the information required.

"Almost every planter or farmer has either heard of, or seen a skeleton leaf. Well, the idea struck me that if the green meat of a leaf could be so effectually removed, as to leave its bones and fibres, or muscles, bare, that the same process, if applied to Date leaf or Rhea fibre, would yield similar results.

"There is some secret about the process which I have not quite found out. But the chemical substance used to prepare a skeleton leaf, is the Per-manganate of Potash, which, if found to answer, could very easily be made in this country, either by importing manganese ore, or looking for it in the iron districts of India; Jubbulpore should produce it.

"The Calcutta chemists could supply Mr. Gouldhawke with a pound or two of London-made Per-manganate of Potash for experimental purposes. Four grains to an ounce of cold water is, I think, the proper proportion. In a sufficient quantity of this liquor, soak the green Rhea grass, there let it stop till fermentation sets in, when wash a sample and see if the fibres will easily separate; if not, remove the old or exhausted liquor, and add a fresh supply—proceed as before. Whenever the fibre separates easily, the work is done. Take out and wash the fibre, and then comb it out with a kidglove-maker's comb. (See Ure's Dictionary, page 599, Article "Glove sewing," for a description.) My idea is, that a light pair of forceps, armed with a pair of these combs (see impromptu sketch), would grip the leaf, separate fibre from fibre, and the mere act of pulling the grass through the comb would produce a clean fibre.

"I hope Mr. Gouldhawke will communicate the result of his experiments."

Agreed to submit Lieut. Pogson's theory, for the consideration and report of Messrs. H. Knowles and R. Morrell.

PAPERS FOR THE JOURNAL.

Read letter from Dr. T. Anderson, dated Darjeeling, 12th August 1868, explaining cause of delay in the preparation of his paper on the identification of Dr. Roxburgh's plants, stating that he was about to return to Calcutta immediately, and hoped nothing would occur to occasion further delay in sending in that and the other two papers, for which he is pledged to the Society.

REPORT ON ORCHIDS EXHIBITED FOR COMPETITION IN JUNE LAST.

Read Mr. John Scott's report, as follows, on the Orchids which were exhibited at the general meeting of the 17th June last:—

"No. 1 of the Orchids sent me is a *Saccolabium*, which I cannot satisfactorily determine. It certainly has much affinity with *S. Blumei*, and may possibly be a variety of that species.

"Nos. 2 and 3 are merely varieties of *Œrides affine*. The latter is the variety called *Lobbii* (formerly *A. Lobbii*, as named by Mr. Mowbray). No. 2 is a pretty and distinct variety which I have not previously seen. I do think all are well deserving of a few marks, and this the more so, as in the case of No. 3, which you say is a fine specimen."

Agreed, that Mr. Samuel Jennings be requested to accord the appropriate marks.

"In December or January, the ground is prepared for the reception of the seed by the ordinary method of ploughing and harrowing,—no manure is used.

"The seed of the Indigo (generally from last year's crop) is then steeped in water for one day, then the water is taken out, and the seed kept covered up for two days more; the seed by that time has germinated, and then hand-planted out in the prepared soil.

"Sixteen seers of dry seed will sow an acre of ground.

"In April or May, the plant reaches maturity, and then the work of eliminating the dye commences, and is carried on in the following manner:—

"*1st.*—The leaves are either plucked, or the slender twigs cut off, and placed in a large vessel, generally a small-sized boat.

"*2nd.*—This vessel is then filled with water, and the leaves or twigs left to steep one whole night.

"*3rd.*—Next morning early the leaves, &c., are collected and thrown away.

"*4th.*—Then some slaked lime-dust is thrown into the water, and well mixed, and blended, and the froth or scum gives out an Indigo-colour.

"5th—Let this settle till the water gets clear, and then throw off the top water, and the Indigo remains at the bottom of the vessel.

"*6th*—Strain this into any suitable vessels, and your Indigo dye is ready.

"There are two pluckings for each sowing, and an acre of land sown with 16 seers of seed yields about 900 seers of dye, which, at the usual Bazar rate of 8 seers per rupee, is worth Rs. 112-8.

"The expenses in cultivating an acre of Indigo are as follows:—

One man's labour for, say, four months, at Rs. 8 per month	32	0	0
Hire ploughing-animals	2	0	0
Cost of lime	3	0	0
Government land tax per acre—(highest rate) ...	1	14	0
Total, Rs. ...	38	14	0

deduct this from the out-turn value, *viz.*, Rs. 112-8, and the profit on cultivating one acre of Indigo is Rs. 73-10—a profit by no means to be despised.

"In some circles of the district, the Government tax is not so high as Rs. 1-14 per acre, but I put down that rate to make a higher comparison between out-turn and expense. If the cultivator is married and has some grown-up children, he will not employ, or have to pay for labour, and if he has buffaloes of his own, which is usually the case, he won't have to pay for them."

Dr. Anderson writes that he received, in good order, some of the seed; and that the plants raised from it will soon be available for comparison with the Bengal Indigo.

ARRACAN COTTON

Read letter, under date September 3rd, from Dr. T. Anderson, submitting three specimens of Cotton, received by him from the Deputy-Commissioner of Sandoway, together with the letter to his address, dated Sandoway, 25th May 1868.

"There are a variety of caterpillars that attack tea, both the leaf, stem, and root, some of which I have by me, and, if you wish, will forward to you."

The Officiating Secretary stated that the above letter, with the specimen leaves and drawing of the Spider, were submitted to Dr. Stoliczka, who, under date 3rd September, reported on them as follows.—

"The red spider which Mr. Peal sent down, and of which he made such characteristic sketches, evidently belongs to the *Acarina*, and probably to the genus *Thyroglyphus*. None of the species belonging to that group of Arachnoideæ possess eyes. They not very usually attack vegetable, but rather more animal substances. I have no books to refer to for a description of the species. The other specimen called 'Black Smutt is a parasitic *Fungus*, the species of which are commonly found on decaying leaves of various plants. There is a large number of species known of that kind of *Fungi*, and the officers at the Botanic Garden may probably be able to find out whether any species of these *Fungi* have been described from India. I should think that they must be pretty well known, for these lower Cryptogamic plants generally have a wide geographical distribution."

Read also a letter from Messrs. Jardine, Skinner & Co., dated August 31st, submitting specimens of blighted leaves plucked from Tea bushes in a garden at Cachar.

Dr. Anderson was of opinion that the blight was caused by a species of Fungus, and offered to forward these specimens to England to the celebrated Cryptogamist, the Rev. J. M. Berkley, and to ask him to identify the species of Fungus.

He also offered to examine and give his opinion on the specimens of Assam blight, received from Mr. Peal: these proposals were accepted with thanks.

NEW FOOD.

Read extract of letter from Dr. Woodford, dated September 4th, reporting on the New Food discovered and prepared by Lieutenant J. F. Pogson. Dr Woodford writes:—

"I have put it to the test, as far as I have been able to do with the quantity sent, and am bound to own have been much disappointed with the result, save that it recommends itself from its cheapness as a substitute for Arrowroot," &c. &c. &c.

Agreed;—to forward Dr. Woodford's report to Lieutenant Pogson, and to suggest that, if he should require a chemical analysis, he should obtain it from some analytical chemist.

ARRACAN INDIGO.

Read letter from Dr. T. Anderson, under date September 5th, forwarding one to his address from the Deputy Commissioner, Ramree, Arracan, dated Kyouk-Phyoo, 4th June 1868, relative to the Indigo grown and manufactured in that district, of which the following is extract:—

Read also letter from Mr. Samuel Jennings awarding, in compliance with the request of the Members of the Society at the last Meeting, the following marks for Orchids exhibided at the June Meeting :—

To Mr. John Lynam—8 marks, 4 each for the new variety of *Saccolabium* and *Ærides affine*, var., grown by him.

To Mr. A. H. Mowbray—5 marks for an imported *Æreides Lobbii.*

Mr. Jennings writes that, had the plant been grown by Mr. Mowbray, that gentleman would justly have been entitled to from 8 to 10 marks, but as an encouragement to the introduction of new varieties, the 5 marks have been accorded.

Thursday, the 29th October, 1868.

S. H. Robinson, Esq., *Vice-President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed; and the following gentlemen elected members.—

Messrs G. H. Landale, J. B. Worgan, c.s., Geo Benson, F. F. Wyman, and the Prince Fuckeeroodeen.

The names of the following gentlemen were submitted as candidates for election :—

Col. R. Duffin, H. M. Bengal Army, Simla,—proposed by Lieut.-Col. E Wintle, seconded by the Secretary.

Lieut-Col. A. G. Nedham, Staff Corps, Dum-Dum,—proposed by Col. Wintle, seconded by Mr. S. Jennings.

E Ruddock, Esq, B C. S. Durbunga, Tirhoot,—proposed by Mr. H. W. Stevens, seconded by the Secretary.

Major Alex. P. Orr, Roy Bareilly, Oude,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

T. H. Bennertz, Esq., Merchant, Calcutta,—proposed by Mr. S. Jennings, seconded by Mr. E. Vancutsem

L. Mondelli, Esq, Tea Planter, Darjeeling,—proposed by Mr. H. M. Herrold, seconded by the Secretary.

W. F. Gillanders, Esq, Solicitor, Calcutta,—proposed by Mr. W. Swinhoe, seconded by Mr. W. Judge.

Baboo Ramessur Roy Chowdhry, Zemindar, Allahabad,—proposed by Dr. James Irving, seconded by the Secretary.

Dr. Edward Gray, Medical Officer, Jorehaut Tea Company,—proposed by Mr. Edward J. French, seconded by Mr. J. Buckingham.

Lieut.-Col. W. H. Stubbs, 4th Regiment N. I., Allahabad,—proposed by Dr. Charles Wilson, seconded by the Secretary.

The following contributions were announced :—

1.—Les Fleurs de Pleine Terre, and Atlas (2 vols.), by Vilmorin, Andrieux & Co., —from the Authors.

2.—A collection of colored drawings of Flowers, Fruits, and Vegetables,—from Messrs. Vilmorin, Andrieux & Co.

3.—Report of the Bombay Chamber of Commerce for 1866-67,—from the Chamber.

4.—Select Papers of the Agricultural and Horticultural Society, Punjab; Annals of Indian Administration for 1866-67, Parts 1, 2 and 3 of Vol. XII; and Birdwood's Vegetable Productions of Bombay, 2nd Edition,—from the Government of Bengal.

5.—Memoirs of the Geological Survey of India, *Palæontologia Indica*, Vol. V., Parts 6—10, and Records of the Geological Survey of India, Vol. I., Part 2,—from the Superintendent.

6.—Report of the Canning Institute for 1866-68,—from the Institute.

7.—Monthly Report of the Department of Agriculture of the United States, for February 1858,—from the Vice-Consul-General, U. S. A.

8.—A sample of uncleaned Cotton grown by the Nagas of Sumoogoodting,—from Lieut. John Gregory, Deputy Commissioner of the Naga Hills

The following is extract of Lieut. Gregory's letter, dated 9th October:—

"This cotton has obtained a reputation throughout these Hills of being superior to that grown either by the Lotah Nagas to the north, or the other tribes to the east.

"Its superiority is said to consist in its being more free from seed, and longer in the staple than the other hill cotton.

"This may be accounted for by the fact of its being grown not in the hills but in the rich terai lands at their foot, and of these many thousands of acres lie waste."

9.—A specimen of a siliceous substance from the Bamboo,—from M. L. Ferrar, Esq., C.S.

"The enclosed substance," writes Mr. Ferrar, "I got from the centre of a bamboo last cold weather, while in camp on the borders of Nipal. I do not know what it is. It appears to be a silicate. Many persons are ignorant that such a substance is produced by the bamboo, and as I have no doubt an examination of it will prove interesting to many Members of the Society, I have thought fit to send it to you."

The Secretary mentioned that the substance submitted by Mr. Ferrar is the Tabasheer of the Arabs, Banslochun of Bengal. O'Shaughnessy states (Bengal-Dispensatory) that the Arabs and the Persians deem it to possess certain medicinal virtues, but that from its composition he is warranted in supposing it to be entirely inert.

10.—A skein of raw silk raised in the Dehra Doon by Captain James Murray, from Cashmere stock,—from Col. D. Gaussen.

(Referred to the Committee for report.)

11.—Samples of a green dye prepared by him from a plant grown on a limited scale in the Dinagepore District,—from Mr. D. B. Nicol.

Agreed that an analysis be obtained of this dye if the cost be moderate.

12.—A small quantity of hybridized *Gloxinia* seed,—from J. Coles Hardinge, Esq., Secretary to the Agricultural and Horticultural Society, Rangoon. Mr. Hardinge states that this seed has been obtained by crossing of "Colleen Bawn" with "No. 34" and others, and he adds,—"I have succeeded in raising many plants from this seed, and I trust you will be equally as successful. The mode adopted by me is to sow the seed in small flat earthen pans (perforated with drainage holes) in a compost of fine sifted sand and leaf mould, the seed being barely covered with the mould. After gently watering with a fine rose, cover the pans with square pieces of glass, exposed where the morning sun can shine on them—the seeds thus treated germinated in a week; when about a month old, prick them out and pot separately in small pots filled with a mixture of sand and leaf mould, or old rotted cow's dung; cover with bell glasses, and as the plants become strong and the tubers form, discard the glasses; they should at all times be kept moderately damp.

"If you could favor me with a parcel of seeds of large growing ornamental trees, such as Melias, Cassias, Guatterias, &c., I shall esteem it a favor, and should you wish for anything from Burma, I shall be only too glad to procure them for you if able."

ARRACAN COTTON.

Read the following Report of a section of the Committee on the samples of Cotton from Arracan received from Dr. Anderson, and submitted at the last Meeting:—

MINUTE BY MR. M. HENDERSON.—Nos. 1 and 2 are white and clean, but both possess, in an undesirable degree, the property of adhering very firmly to the seed. The cost at Sandoway of No. 2 is stated at Rs. 49-8-0 for 540lbs. of seed cotton, from which 162lbs. of clean is produced. This would give a first cost of more than 7*d.* per lb. without reckoning the cost of cleaning, which, in consequence of the above-mentioned peculiarity, would probably be considerable. From this it is evident that it cannot be laid down to a profit in Europe when the cotton market is in a normal condition.

No. 3 appears to have been grown from foreign seed, probably Brazilian. In Calcutta I have found a similar cotton fruitful during the first year. The only defect I notice is, that the staple is somewhat weak, but despite this there is no doubt that it would meet with ready sale in the home markets. The sample, however, is too small to report upon very accurately.

MINUTE BY MR. ANDREW STIRLING.—I have examined the three specimens of cotton sent to the Society by the Deputy Commissioner of Sandoway.

Nos. 1 and 2 are very similar in general character, the latter, however, being the better of the two; the staple is short and harsh, perhaps not so much so as the Arracan cotton reported on last June, but in both the fibre adheres most closely to the seed, which is a most decided objection. I think the chief value of these specimens is that they show cotton can be cultivated in the district, and that if the cultivators had better seed in their hands, and if there are facilities of getting their crop to a market, they could very well grow for export.

The sample of No. 3 is small and hardly sufficient to show the quality well; the staple is good, and appears to come away well from the seed, it is similar to some kinds of South American cotton. The fact that the plant does not produce till its third year would be a very great, if not an insuperable, objection to its cultivation in India generally, and I suppose in Arracan too, as the natives would not afford to wait so long for a return on their outlay.

CARTER'S VEGETABLE SEEDS.

Read a Report from the Society's Gardener on the English vegetable seeds. Thirty-two kinds had vegetated, some 40, some 60, and some 80 per cent, or a general average of 64. Eleven kinds had not germinated up to date.

RHEEA FIBRE.

Read a Note from Mr. H. Knowles in reference to Lieutenant Pogson's letter, and sketch, which were submitted at the August Meeting, regarding the "Rheea" (*Bœhmerian ivea,*) and the difficulty which at present exists in taking the fibre from the stalk in an economical manner. Mr. Knowles is of opinion that the comb to which Mr. Pogson refers would only answer if the teeth were of light material. "The fibre is easily got from the stalk, but then the difficulty commences, as it will not stand rough usage, and it takes a great deal of trouble to make it clean. We have only been able to do it by hand as yet, and this is too laborious and expensive."

In connection with the above, the Secretary called attention to the following extract of a letter from Mr. Gouldhawke.—

"The remarks made by Lieut. Pogson on the mode of preparing the skeleton leaf coupled with a long leaf or blade of grass, being drawn in the sketch he sent me through you, induce me to think he has mistaken the nature of the Urtica Rheea, and has been misled by its name "*Grass* cloth plant" into supposing it a grass, the pulpy portion of which might be torn off by means of the toothed instrument he sketched.

"The Urtica Rheea is a plant resembling the English nettle, and its fibre could could not be scraped off its stalks by means of a gin. The stalks grow six or seven feet high *with numbers of side shoots.* Had it a single straight stalk like the jute without side shoots, it would be easier to manage."

TEA CULTIVATION IN CEYLON.

Submitted the following letter from Mr. W. Minto, dated from the Dehra Doon, 17th October, in reference to the introduction of Tea into Ceylon:—

I saw a notice in the *Englishman* of the 14th instant about the introduction of Tea into Ceylon, and that the Agricultural Society had been requested to forward a few Wardian cases of seed to Peradeniya.

When travelling through Ceylon in 1864, I remained a few days with Mr. Norris at Pussulawe, and was rather surprised one morning to come across a patch of about 2 acres of good China tea, growing I may say luxuriantly, but all thin long branches. He informed me that above 20 years previous (if I remember correctly) a friend had sent him the seed round from China, and that, not knowing much about it himself, the seed had been sown promiscuously. The only attempt to manufacture tea was by two Chinamen being sent up by his brother from Colombo, but as the few pounds they made cost him (including their wages and travelling expenses) over Rs. 28 per pound, he did not prosecute tea-making any further.

The tea, however, was turned to a useful purpose. He noticed that the growth was rapid and the twigs like osiers; he informed me that they had been most useful in making wicker baskets. When I visited the place it was in August, and I found the tea, as described, a shrubbery of long thin twigs (the effect of pruning and cutting) from 6 to 8 feet in height; the bushes that had not been cut down were full of seed, and it appeared to be quite ripe at that time. I got a lot gathered, and showed how to put it out, and made about 2 pounds of tea myself, but I fear from want of proper drying—for I had no regular means of doing so—it may have had a harsh taste. I sorted in samples, but what became of it, and if it was ever tested I never heard, for shortly afterwards the estates were sold, and I think Mr. Norris went home.

Tea will grow, and I have no doubt well, at that elevation in Ceylon, and as there is plenty of rain, it ought to produce fairly.

But the question is— whether with the high rate they pay for wages, and at times the high rates ruling for rice, it will prove a paying thing, is greatly to be doubted.

Our experience in Assam and Cachar would not point to it, especially with the rate ruling for tea in the London market now, which, if they do not entail a positive loss, will leave this year a scant profit to producers.

NEW FOOD.

The Secretary next read a paper from Lieutenant Pogson, submitting further particulars in respect of his "New Food," with a comparative analysis of other articles of food :—

"I have now the pleasure to forward, for the information of the members of the Agricultural Society, a comparative analysis of various kinds of flour, and meal, bread, meat, milk, and also of my new food.

"In reference to the new food, I should be much obliged for any suggestions as to its improvement. You will see that in starch and gluten, the food is richer than any grain, and consequently that the supply of respiratory and nitrogenous sulphurised matter is ample. But it is deficient in fat, vegetable casein, and mineral matter, all of which can be added. Thus in the milk porridge, every necessary component is present, the milk supplying those which were wanting in the flour or new food.

"A comparison between the analysis of bread and the meat, and the new food and milk, will show that for nourishing purposes, they are nearly equal, or as 25 to 26 and that for breathing or respiratory purposes the new food is superior, as shown, by the figures 48 and 83½, the difference 35½ being in favor of the milk porridge, which is made a fattening food by the addition of some butter to the rich man's porridge, and *Ghee* or *Till* oil, to the poor man's water porridge.

"The new food in the shape of milk porridge has now been tried by a good number of ladies, gentlemen, and children of all ages, from 18 months to 15 years, and all have approved of it.

"A lady has been so kind as to conduct its trial on a child 18 months old, and the little creature has now been fed exclusively for twenty-two days on the food, which it prefers to any other food, and is thriving on it and fattening into the bargain. The porridge in this case was made with hot-water, butter, and sugar. This child consumes 160 grains of the food at each meal, of which it has four between sunrise and 7 and 8 P. M. It was found on trial that 120 grains was not sufficient for one meal, and 240 grains was too much. Thus it will be seen that a young child has, for 22 days, been fed to its heart's content, on one ounce and 160 grains of the food per diem. I think it will be admitted that a food, of which 1⅓rd ounce is sufficient for the daily wants of a hungry healthy child, is a desideratum for all classes, and especially so for the poor of all countries.

"Another very satisfactory trial was made on a woman servant, almost immediately after her confinement; she complained of loss of strength and very great debility accompanied with febrile symptoms; a course of the food was suggested and tried, and after a few meals (5 or 6) health and strength began to return, and before the pound of food was finished, the woman had resumed her work and duties.

"The new food is made from a cultivated grain, and I think that by treating wheat and Indian corn in the same manner, the sustaining and nourishing power of these cereals will be very considerably increased. In fact I feel convinced that the pure starches, such as Arrowroot, Potato Starch, Brown and Polson's Corn Flour, Sago, and Tapioca, may, by my process, be converted into highly nourishing food, whereas at present they simply supply the body with respiratory matter. Professor Johnston observes—'Hence arrowroot, which is only a variety of starch, cannot give strength without an admixture of gluten, in some form or other. To condemn a prisoner to be fed on arrowroot alone would be to put him to certain death by a lingering torturing starvation. The same is true, to a less extent, of tapioca, and of most varieties of sago, all of which consist of starch, with only a small and variable admixture of gluten.'"

MISCELLANEOUS COMMUNICATIONS.

The following letters were likewise submitted :—

1.—From Secretary to the Government of Bengal, transmitting copy of a Report from Dr. Cleghorn, Conservator of Forests at Madras, of his journey to Malta, and the Continent of Europe, and of his visit to the Imperial Forest School at Nancy.

2.—From Secretary to the Chief Commissioner of Oude, forwarding copy of a letter from the Foreign Secretary to Government, and requesting that a copy of the Society's Prize Essay therein alluded to, on the cultivation of the Date Palm, may be sent to him as a guide to the culture of the tree in Oude.

3.—From Dr. A. C. Maingay, Superintendent of the Central Prison, Rangoon, tendering his thanks for his election as a Corresponding Member of the Society.

4.—From J. C. Wilson, Esq., Wellington, New Zealand, acknowledging receipt of Rhododendron seeds, and promising to send, in return, seed potatoes and seed of the New Zealand flax *(Phormium tenax)*.

5.—From Dr. Charles Meller, Director of the Botanic Garden, Mauritius, applying for some healthy sets of good description of sugarcane to replace the stock in the Island, which has suffered much from long drought, severe hurricanes, and diseases which threaten to destroy some kinds altogether.

Resolved to meet the application to the best of the Society's ability.

From Messrs. Law, Somner & Co, enclosing bill of lading and invoice of annual supply of agricultural seeds per *Portlaw*, which left Melbourne so late as the 10th September.

Resolved,—that as the consignment has not yet come to hand, and will consequently be too late for this season's sowings, Messrs. Law, Somner & Co. be instructed not to send these annual supplies in future unless they can despatch them so as to reach this in September.

For the above communications and presentations the best thanks of the Society were accorded.

Wednesday, the 18th November 1868.

S. H. Robinson, Esq., *Vice-President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members :—

Col. R. Duffin, Lieut.-Col. A. G. Nedham, Major A. P. Orr, Messrs. E. Ruddock, T. H. Bennertz, L. Mondelli, W. F. Gillanders, Baboo Ramessur Roy Chowdhry, Dr. Edward Gray, and Lieut.-Col. W. H. Stubbs.

The following gentlemen were proposed for election :—

Dr. Arthur Adey, 15th Bombay N. I., Mhow,—proposed by Major Frederick Lukin, seconded by the Secretary.

Manager, Serajgunge Jute Company,—proposed by Mr. S. P. Griffiths, seconded by the Secretary.

The following contributions were announced:—

1.—General Report of the North-Western Province Exhibition, held at Agra, February, 1867; Annual Reports for 1867-68 of the Administration of the Bengal Presidency, and of the Central Provinces and Oude; Annual Reports for 1866-67 of the Administration of Mysore, Andaman Islands, Oude, and Coorg; and Records of the Geological Survey of India, Vol. 1., Part 3,—from the Government of Bengal.

2.—Monthly Reports of the Department of Agriculture of the United States for January to June, 1868; October to December, 1867,—from the Vice-Consul General, U.S.A.

3.—Records of the Geological Survey of India, Vol. 1., Part 3, 1868,—from the Superintendent.

RARE PLANTS.

Mr. Lynam exhibited a specimen of *Phalænopsis rosea*, for which 8 marks were awarded. Mr. Jennings showed a plant of *Anæctochilus Ordii*, a large and a new species which he had recently received from Borneo, and which has not been previously seen in this country. It has large, velvetty leaves, nearly four inches in length, of a deep brown color, veined with a metallic red. The plant is of a strong, robust habit, and was found adhering to moss-covered rocks. It was agreed to defer the award of marks till the next Meeting. It will remain in the interim in the Society's rooms for exhibition.

The Council submitted a recommendation, involving certain changes in the Secretariat establishment for the better arrangement in respect to the distribution of Seeds in future to Country Members. This recommendation will involve some additional outlay, which it is proposed to debit to the Seed Despatch Agency Fund.—Agreed to.

ASSAM COTTON.

Read the following report from a section of the Committee on the sample of uncleaned Cotton submitted at the last Meeting, as grown by the Nagas of Samagoodting, and forwarded by Lieut. Gregory, Deputy Commissioner of the Naga Hills:—

Mr. Andrew Stirling—"I have examined the sample of Cotton from the Naga Hills. It seems to be very like the Cotton from the districts to the south of Cawnpore, and more around Agra, and I would class it as Fair Bengal, at present worth from Rs. 21 to Rs. 22 here; as to fineness the staple is more like that of Cawnpore Cotton, but as to length it most resembles Agra quality. The Cotton appears to adhere firmly to the seed, and probably the percentage of clean Cotton may be smaller than it would be in the up-country Districts.

"I may add I think this description of Cotton more marketable and more likely to pay the cultivator than the Arracan Cottons lately sent to the Society to be reported on."

Mr. M. Henderson—"This sample of Cotton from the Naga District is of the same description as that recently reported upon from Arracan, but is somewhat coarser and inferior in color, doubtless owing to carelessness in gathering. The staple is irregular, and the sample generally I consider to be below the standard of fair Bengal.

"It would have been interesting to learn the cost of this Cotton in the district both cleaned and on the seed, as also the production per acre, so as to arrive at some idea as to the capability of the soil, with a view, if advisable, to the introduction of a class of seed which would yield a more marketable quality of Cotton."

SILK RAISED IN THE DEHRA DOON.

Read a report from Mr. E. G. Buskin, a Member of the Silk Committee, on the raw Silk raised by Captain Murray in the Dehra Valley from Cashmere stock:—

"I have examined the skein of silk produced by Captain Murray, and the following is my report:—Good color and quality, and reeled from very superior cocoons, but very mixed and uneven in size of thread, varying from 5 to 12 cocoons in different parts of the skein; also very insufficiently cleaned, large knibs or pieces of cocoon being left on the thread.

"Winds pretty well.

"If this silk were carefully reeled, say from 4 to 5 cocoons to the thread, and well cleaned, it would be worth now Rs. 25 to 26 per F. Seer. In its present state, it would not fetch more than Rs. 18 to 19."

GUM FROM THE CHEROONJEE TREE.

Read also a report from Messrs. R. Scott Thomson & Co, on a sample of Gum received from Mr. Dumaine, as the produce of the Cheroonjee or Peeyal (*Buchanania latifolia*):—

"We have carefully examined the sample of the Gum of the *Buchanania latifolia, Rox.* and find, by chemical analysis, it resembles the Bussorah Gum, but has superior adhesive properties, similar to the Gum Acacia, which gives it a higher commercial value, and it can be used in the place of Acacia Gum for dressing cloth."

In connection with the above, the Secretary drew attention to a fine sample of the oil of this tree, which has been in the Society's collection for upwards of 20 years. The oil is expressed from the kernel of the nut, which is also much used in native confectionary.

Reports from the Gardener on the germination of the French flower and vegetable seeds were likewise submitted, and ordered to be retained for next Meeting for comparison with the reports which may be then expected.

A few miscellaneous communications were also placed on the table, for which, and for other contributions, the best thanks of the Society were accorded.

Thursday, the 17th December 1868.

J. A. Crawford, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members :—

Dr. Arthur Adey, and the Superintendent of the Serajgunge Jute Company.

The Honorable Sir Richard Temple was proposed as a member by Mr. L. Berkeley, seconded by the Secretary.

The following contributions were announced :—

1.—Geographical and Statistical Report of the Districts of Jessore, Furreedpore, and Buckergunge,—from the Government of Bengal.

2.—Peeps into Social Life in Calcutta a Century Ago, by the Rev. J. Long,—from the Author.

3.—Report on the Cultivation of Cinchona in Bengal, from 1865 to 1868, by Dr. Thomas Anderson,—from the Author.

4.—Journal of the Asiatic Society of Bengal, Part 1 No. 2, and Part 2 No. 4 1868,—from the Society.

5 —Five small bags of Hallet's Pedigree Wheat,—from Dr. Forbes Watson.

6.—A quantity of Deodar Seed,—from the Agricultural and Horticultural Society of the Punjab.

The President commenced the Proceedings of the Meeting by announcing that in accordance with the Resolution passed at the General Meeting in August last he had, during his recent visit to England, communicated personally with Mr. Grote on the subject of his portrait. As Mr. Grote had not then settled with any one to take his portrait (Sir F. Grant's hands being too full), and as he (the President) could not at the time arrange for any one to take a copy, he had begged Mr. Grote to undertake the duty, to which he had agreed. He (the President) would, therefore, now move that the sum of £50, previously proposed, be remitted by next mail to Mr. Grote to enable him to carry out the wishes of the Society. This was unanimously agreed to.

The President next called attention to the loss which the Society had sustained, since the date of the late Meeting, by the demise of one of its Vice-Presidents, and submitted the following expression of regret on the part of the Council :—

"The Council desire to express their sincere regret at the death of Rai Hurro Chunder Ghose Bahadoor, one of the Vice-Presidents of the Society ; and though his connection with the Society was of short duration, he evinced much interest in its affairs from his love of horticultural and floricultural studies, which he had practically prosecuted for many years."

Proposed by Baboo Peary Chand Mittra, seconded by Mr. W. J. Judge, and unanimously resolved,—that this Meeting cordially sympathizing with the terms of the above Resolution of the Council, desires that the same be placed on record, and that a copy thereof be sent to the family of the late Rai Hurro Chunder Ghose Bahadoor.

The Secretary having intimated the receipt of the three sets of Norton's Tube Wells which were ordered in May last, it was agreed that an experimental trial of them be held on an early date, as soon as arrangements for their working can be made.

Supplementary Reports were submitted by the Gardener on the French Flower seeds and English Vegetable seeds, imported this year by the Society. Ordered that these be retained pending the receipt of further reports which may be expected by next Meeting.

In connection with the above, the Secretary submitted a report with which he had been favored by Mr. Henry Cope, of Umritsur, on the French Flower seeds received from the Society, and of which the following is an extract:—

"In compliance with my promise, I write a line regarding the result of the French flower seed sowings.

"I think that, on the whole, Messrs. Vilmorin Andrieux's supply may be considered so far successful that a larger number of species have vegetated, and perhaps in larger numbers than used to be the case with the seeds obtained from Messrs. Carter and Co., but their germination has been somewhat slow. Of the vegetable seeds, especially the Peas, I am sorry to say I cannot write so favorably.

"I deem it right at the same time to mention that a collection of flower seeds I obtained direct from Messrs. Carter and Company has turned out most satisfactorily. Of one hundred and forty kinds not more than eight have totally failed, while among those that have germinated are several kinds that I have never succeeded in rearing before, such as Asters, Rhodanthe, Ipomopsis, &c. Of the whole collection I may say that the seeds germinated by four days earlier than the Paris seeds, though, in both cases, I used exactly the same leaf-mould—of the finest kind, and upwards of a year old.

"If Carter would supply the Society with seeds equal to those sent me, I am of opinion that the balance of advantage to members generally would be in their favor."

In a subsequent letter, and in reply to an enquiry, Mr. Cope writes:—

"I cannot say for certain that the seeds of my previous collection from Carter and Co. were of the gatherings of 1867, but I should strongly infer so from the fact that they were dispatched early in September, and cannot, therefore, well be the seeds of 1868. Since I wrote you I have still further reason to be satisfied with my collection, as the percentage of failures has been further reduced by the germination of three or four species that had not come up when I wrote you."

The Secretary next called attention to the 26 pots on the table filled with annuals raised by the Gardener from acclimatized seeds, and read his memorandum, dated 17th December, referring thereto to the following effect:—

"These seeds are the produce of the Society's garden gathered in March, April, "and May last. After cleaning and carefully drying they were put in a tin and "soldered up, and re-opened first week in November. These pots were sown broad-"cast merely for trial. I had in all 33 kinds put up; 26 have done very well, as "these pots will show. 5 died off by being too long in seed pots, and 2 either "failed or else came up very sparingly. I was afraid all would be injured, as the "rains began before I had closed up, and we had then some 12 days continuous "rains. However, the result is very satisfactory, and (I think) clearly shows the "superiority of acclimatized over imported seed."

The following memo. refers to seeds of the same gathering, but kept in a different manner. The result shows the advantage of keeping seeds in tin, hermetically sealed, in preference to glass, in the damp climate of Bengal. The seeds must, however, be thoroughly dried before they are packed in tin, or they are liable to lose their germinating property:—

"A quantity of annuals, 33 in number, and same kinds as those sent up to this day's Meeting, were put up at same time as the tin, and had exactly same treatment, but were placed in a bottle well stopped with cotton wool and then placed in a drawer, and not opened till same time the tin was opened, two only of these germinated, *viz.*, Sweet Pea and the Hibiscus, these two probably at rate of 20 to 40 per cent."

The Gardener further reports that he has now ready for distribution a quantity of annuals and plants of *Mesua ferrea* (Nagkeesur) for any Members who may desire to have them.

The Secretary announced the receipt, since the last Meeting, per *Portlaw*, from Melbourne, of the consignment of agricultural seeds, ordered from Messrs. Law, Somner and Co., in the early part of the year. The receipt so very late in the season of this supply had prevented a general distribution, but no time had been lost in sending to those Members whose names had been previously registered. Though the seeds had reached in excellent condition, he feared the lateness of the season would prove prejudicial to their growth.

COTTON RAISED AT MYNPOORIE.

Read the following report from a section of the Committee on two samples of cotton recently received from the Collector of Mynpoorie, grown by Dr. Tyler, the Civil Surgeon, one from Sea Island, the other from Hingunghat seed:—

Mr. Andrew Stirling.—"I have examined the samples of cotton sent by the Society grown at Mynpoorie.

"Both are very white and free from stain, that grown from Sea Island, though fine, is short in staple for that class of cotton, and adheres very firmly to the seed, and the loss would probably be considerable in cleaning it.

"The cotton grown from country seed comes from the seed more readily than the other, but is also short, and does not come up to Hinghunghat.

"In both cases every thing depends on the cost of cultivation. The latter would probably sell for Rs. 23 or Rs. 24 in Calcutta at present, and the former, though really a higher priced class of cotton, would not fetch much more, as there is no market here for such descriptions.

"I may add the present prices of cotton here are higher than they are likely to continue."

Mr. Joseph Agabeg.—"The cotton raised at Mynpoorie from Hingunghat seed is an improvement over the indigenous Mynpoorie, or, as generally called, Agra cotton (Mynpoorie lying between Agra and Cawnpore). In strength it is weaker than Agra, and unprofitable to spinners, and in staple longer, and, being whiter and free from rain spots (as most cotton grown this year will be, owing to absence of rain in October and November), I value according to our present market rate, say Rs. 24 a maund.

"The sample from Sea Island seed is deteriorated; both the soil and climate are utterly unsuitable for the growth of Sea Island cotton, and I recommend that if any seed is sown in the North-West it ought to be Mexican, so that both the strength and staple should turn out according to the greater portion of England's present demand.

"In all cases I think a fair quantity should be shipped either to England for opinion as to the result when converted into twist or to Bombay to spinners for their opinion. Samples alone will never give us the result, or even a probable test of the quantity of twist produced."

GREEN DYE FROM DINAGEPORE.

Read the following report from Mr. D Waldie on Mr. Nicol's cakes of "Green Dye" from Dinagepore, which were submitted at the October Meeting:—

"I have carefully examined the sample of green matter in cakes you sent me for the purpose. Its general composition is as follows.—

Resinous, fatty, and colouring matter (Chlorophyl) ...	8·3
Matter soluble in water and alkaline liquor	33 6
Vegetable fibre	48·0
Moisture	9·6
	100·0

"When burnt it leaves a large quantity of ash, above 39 per cent., chiefly in soluble earthy matter.

"The coloring matter for which it was chiefly examined is insoluble in water and spirit, very slightly soluble in fixed oil, oil of turpentine, bisulphide of carbon, and slightly even so in benzole. Alkaline solutions extract some colouring matter, but at same time injures it and spoils the colour. The only good soluble I have found for it is Ether.

"The colouring matter is simply Chlorophyl—the ordinary green colouring matter of vegetables—perhaps existing in larger proportion than usual. I am not aware that it would be of any use for economical purposes."

REPORT OF SUB-COMMITTEE ON SOCIETY'S GARDEN.

Read the following preliminary report of the Sub-Committee of the Council:—

"Your Committee met Dr. Anderson on the 8th instant to communicate with him in respect to the final transfer of the Garden, and the necessary steps to be taken in connection therewith, and of Dr. Anderson's letter to Government of Bengal of the 27th August 1867; and now beg to submit a preliminary report as follows:—

First.—That the proposal for the distribution of flowering plants and fruit grafts to members of the Society from the Botanic Garden stock be entertained, a proviso to be added in respect to the period (4 years) 'or to terminate at any period after the end of two years, on 6 months' clear notice.'

Second.—All receipts from the sale of fruit grafts, flower pots, glazed cases, boxes, &c., to be credited to the Royal Botanic Garden.

Third.—The Society to be charged Rs. 1,800 annually for the privilege of being allowed to indent on the Botanic Garden stock for flowering plants and fruit grafts for its Members according to the practice and terms hitherto observed by the Society."

METCALFE HALL, } S. JENNINGS.
Calcutta, 10th December 1868. } S. H. ROBINSON.
A. H. BLECHYNDEN.

The Report was adopted.

Read a note from Dr. Anderson, enclosing a memorandum from Colonel J. C. Haughton, Commissioner of Cooch Behar, concerning the voracity of Peafowls, as verified in the following extract from the diary of the Assistant Commissioner of the Garrow Hills:—

"I shot a Peafowl. In its crop, I found no less than 29 (twenty-nine) green "chillies besides some 'Gochaloo,' and leaves of the cotton tree. Peafowls are very "numerous about here, and must, if their appetites are generally as good as the one "I killed, do considerable damage to the Garrow crops."

Read a letter from Colonel E. Money, enquiring if the Society would receive an essay on Tea culture and manufacture, and what amount of remuneration they would be inclined to give for it.

In submitting the above letter the Council are of opinion that, as the Society only recently awarded prizes for the same object, any further offer be deferred for the present. Agreed to.

From Dr. Browne, Secretary, Agricultural and Horticultural Society of the Punjab, acknowledging receipt of the medals, silver and bronze, previously applied for.

From Mr. L. Desmazures, Lucknow, offering to send a small sample of a "Green vegetable dye," which, he states, he has lately discovered, and requesting the Society to have it chemically tested, and the proper mordant employed to render the colour permanent.

Agreed, on the recommendation of the Council, to inform Mr. Desmazures that he should apply direct to a chemist, as the Society are not prepared to defray the cost of analysis for private purposes.

REPORT

OF THE

Agricultural & Horticultural Society

OF INDIA.

Report from the Council to the Society at the General Meeting of the 20th January 1869.

The Council have again, at the commencement of another year, to offer a brief review of the operations of the past twelve months.

The number who have joined during the past year (91) is rather below the average of the past decade. The proportion of elections from the mercantile community and those engaged in agricultural pursuits is satisfactory; whilst the native community is, as usual, very poorly represented. It is, however, gratifying to observe that, though the addition of new names is less by 25 than in 1867, the loss by deaths, resignations, &c., is also lower, namely 101 against 129.

The distribution of Members as they now stand may be referred to the following list :—

CLASSIFICATIONS.	In 1861.	In 1862.	In 1862.	In 1863.	In 1864.	In 1865.	In 1866.	In 1867.	In 1868.	Gross Total.	Total real number at the close of 1868, after deducting the lapses.
Honorary Members ...	18	0	0	0	0	0	0	0	2	20	10
Associate Members	4	0	0	0	0	0	1	0	0	5	2
Corresponding Members	5	1	0	0	2	0	0	1	1	10	7
Civilians	500	22	13	12	18	30	18	16	17	646	191
Merchants and Traders	430	17	19	24	17	22	11	21	13	574	144
Indigo and other tropical agriculturists...	360	15	21	20	20	41	28	24	16	545	150
Military Officers	444	26	25	10	21	31	9	19	20	605	136
Medical Officers	161	6	7	5	7	14	5	7	6	2 1	60
Asiatics	183	8	3	7	9	8	9	7	8	242	63
Clergy	27	0	0	2	0	3	3	1	0	36	10
Law Officers	81	2	4	2	3	4	8	4	4	112	32
Miscellaneous	50	0	12	9	3	10	16	16	4	120	59
	2,263	97	104	91	100	163	108	116	91	3,133	864

N.B.—Of these 864 Members, 185 are resident in Calcutta, 551 in the Country, and 129 in Europe.

The lapses alluded to in the last column comprise 17 deaths, 42 resignations, 17 struck-off, and 25 removals from the list, in accordance with Section 6 of Chapter III. of the Bye-Laws, their absence from India having exceeded four years, making in all 101.

Of the total number (864) in the foregoing list, 34 are Life-Members, 97 are absent from India, 19 are Honorary, Associate and Corresponding, leaving 714 as the number of paying Members on the books of the Society, or four less than last year.

The Society has been singularly unfortunate in the loss of three Members by death from the limited number representing the Native community, who have taken an active interest in its operations, *viz.*, Baboo Prosonno Comar Tagore, Baboo Ram Gopal Ghose, and Roy Hurro Chunder Ghose Bahadoor.

Joining the Society so long ago as the year 1833, and at the period of his demise the oldest member on the list, Baboo Prosonno Comar Tagore was a frequent attendant at its meetings in its earlier days, and actively co-operated with the Society for many years. Baboo Ram Gopal Ghose attached himself to the Society in 1840, and from that time till within the last few years, when his health had given way, was a constant working member, and in such capacity rendered valuable service. He was several times elected a Vice-President of the Society. Roy Hurro Chunder Ghose's connection with the Society was more recent, but he evinced much interest in its affairs, more especially in respect to floriculture. He was at the period of his demise, a Vice-President of the Society. Resolutions expressive of the regret of the Society at the loss of Baboo Ram Ghopal Ghose and Roy Huroo Chunder Ghose, were passed at the Monthly Meetings of January and December, and the Council would again take this opportunity to deplore the departure of Members who set so good an example to the large body of Zemindars, and educated Native gentlemen generally, and to express the hope that others may be induced to follow in their steps. Among other Members who have been taken away during the past year the Council would record, with much regret, the names of Messrs. James Forlong and Alexander Sawers, two old and tried associates, whose experience was of much value on all subjects connected with rural economy.

Before passing on to other topics, the Council would desire to allude to another great loss which the Society has sustained by the departure, from India, of Mr. Arthur Grote. The proceedings of the Society enter fully into the action taken on the resignation of Mr. Grote of the office of President (which he had held for seven years consecutively), to mark its sense of the untiring zeal and ability which Mr Grote brought to bear on the various subjects which have occupied its attention during the long period of his Presidentship. The Society unanimously nominated him an Honorary Member, and presented him with an address in July, just previous to his departure. They have also resolved that his portrait should be placed in the hall of the large meeting room, with those of two former Presidents, Sir Edward Ryan and Sir Lawrence Peel; and with this view, have asked him to have a copy made of his portrait of himself, which is to be placed in the rooms of the Asiatic Society.

The Rev. T. A. C. Firminger, the author of a "Manual of Gardening for India," has also been elected an Honorary Member; and Dr. A. C. Maingay, Civil Surgeon of Rangoon, a Corresponding Member of the Society. The former gentleman had been several years an Ordinary Member before finally quitting the shores of India.

The financial condition of the Society has now to be considered. Though the amount realised during the past year exceeds by Rs. 4,000 the average (Rs. 20,000) of the last five years, the sum outstanding for arrears of subscriptions, after deducting Rs. 1,290 considered irrecoverable, *viz.* Rs. 10,727-6, is still much larger than it should be. This has not proceeded for want of application, for reminders are constantly addressed throughout the year. In alluding again to this subject, the Council reiterate the hope that Members will, in future, consider the just claims of the Society. The present facilities for remitting small sums from various stations in the Mofussil to the Presidency, leave those who continue to neglect these repeated calls without any excuse for their remissness. In addition to the sum above mentioned, *viz.*, Rs. 1,290, the Council fear a sum equally as large, if not larger, will have to be deducted as irrecoverable during the current year.

The usual financial statement will be found at the end of the Report. The total Receipts during the year, it will be observed, amount to Rs. 37,152-1-3, including the balance in hand (Rs. 860-9-11), at the close of 1867; and the Disbursements to Rs. 36,239-3-7, leaving a balance in hand of Rs. 912-13-8. The Vested Fund remains at the old figure, Rs. 16,633-5-3. The Liabilities amount to Rs. 10,035 against a Dependency of Rs. 13,839-12 for arrears of subscription, for seeds, plants, &c.

Allusion was made in the last Report to the efforts of the Society to obtain from Government a piece of ground on an eligible site in place of the land in the Royal Botanical Gardens, which they are surrendering. A portion of the unoccupied grounds belonging to the Kidderpore Military Orphan Asylum was pointed out as a desirable spot—the most desirable, all circumstances considered, that could be selected. The question, the Council regret to observe, still remains unsettled. It is, however, satisfactory to record that the Government of India have on a second appeal, consented to grant the Society the sum of Rs. 12,000 instead of Rs. 6,068 originally awarded, as compensation for the improvements made on the land they are giving up.

The operations of the Society in the distribution of plants has necessarily been on a limited scale during the past year, consequent on a decreased area of land under cultivation. Nor has any new stock been added, as the ground will have to be given up as soon as the necessary arrangements for transfer have been completed. Dr. Anderson, the Superintendent of the Royal Botanical Gardens, has agreed, for an annual charge of Rs. 1,800, to allow the Society to indent on his stock for flowering plants and fruit grafts to meet the requirements of Members till such time as another garden has been formed. The returns submitted by the Gardener shew that the distribution of plants during the past season have been 12,299 ornamental plants, 1,284 fruit grafts, and 1,140 cuttings of Roses and flowering shrubs. Several Wardian cases have also been issued. The number of applications have been 140.

The Annual Horticultural Exhibition was held in the Sailors' Playground on the 15th February, the collection of vegetables, though probably not equal to that of 1867, was altogether very creditable to the exertions of the market gardeners—the more when so the destruction caused by the Cyclone on the previous 1st of November, is considered. For the same reason, the display of flowers was inferior to those of previous years. Rs. 533 were distributed in prizes.

In connection with this subject it may be mentioned that new, rare and interesting plants were shown at the several Monthly Meetings, for which marks were awarded, thus continuing the practice of the previous year. The Council would, however, be glad to see more competition on these occasions, and from a larger number of gardens. It should, however, be observed that a great discouragement to the introduction and culture of rare exotics in our Calcutta gardens is caused by the frequent robberies that have taken place during the last few years whereby many valuable plants have been entirely lost, and others mutilated; all efforts to discover the guilty parties have hitherto been unsuccessful, though the Society has offered, twice during the past year, the sum of Rs. 200 to any person who may give sufficient evidence to lead to the conviction of the thieves.

The large annual importation of seeds has been but partially successful. The consignment of vegetable seeds from North America has afforded general satisfaction. That from Australia has also reached in good condition, but too late in the season to be of general service. The supply of vegetable seeds from Messrs. James Carter & Co. of London, much more limited than usual, has not afforded general satisfaction; nor has the large supply of vegetable and flower seeds from Messrs. Vilmorin, Andrieux & Co. of Paris. The trial assortment in 1867, from this latter firm, was so favourably reported on, that a large order was sent to them for 1868, but the result has not answered expectations. It is proposed to take other * precautionary measures for next season to protect these consignments from the damp climate of Bengal.

In addition to vegetable seeds for Jail gardens, the Society have responded to applications for supplies of field and other seeds for trial at Cooch Behar, Assam, and Shillong.

Various subjects of interest, though none of a particularly important nature, have engaged attention during the past year, some of which it may not be out of place to refer to in this Report.

It was stated in the last Report that, encouraged by the amount of information obtained in respect to Tea culture, the Council had suggested the issue of a Circular on the subject of Rice Cultivation and yield. This Circular has been so generally responded to, that it has placed the Society in possession of a mass of useful information, which will be shortly prepared in a digested form for publication in the Journal.

Allusion was also made in the last Report to the question of promoting the diffusion of agricultural knowledge in Bengal, as suggested in a communication from Mr. John Stalkartt to the Lieutenant Governor,

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* The Seedsmen have been instructed to send out overland, previously to the arrival of the consignments of their shipments of seeds in Calcutta, measurements of the several separate packages, in order to have tin boxes prepared of the required sizes, and the seeds transferred into them, immediately on the opening of the original cases. And on the subject of this important precautionary measure, circulars are being separately addressed to Members who have had their shares hitherto delivered packed simply in paper.

and on which the Government desired to be favored with the suggestions of the Society in respect to the establishment of Model Farms, &c. It may now be mentioned, by way of record, that the Lieutenant-Governor is not prepared to recommend any action being taken at present with the object in view, as he is "satisfied that no advan-"tage would result from such institutions commensurate with their "expense."

It was mentioned in the last Report that steps had been taken to obtain seeds of *Chenopodium Quinoa* from South America, for introduction into localities in India suitable for its culture. This seed, through the kind offices of Dr. Forbes Watson, was received during the past year, and portions distributed to Darjeeling, Ootacamund, and Shillong. Dr. Watson having sent a quantity direct for trial to the Himalayas, it was deemed unnecessary to forward any to that quarter from the stock received. Dr. Anderson reports that the seeds had all germinated well at Darjeeling, and has promised to communicate, in due course, the result of sowings.

The subject of the Grant Testimonial Fund has been alluded to in more than one of the Reports of previous years. The question was re-considered at the June Meeting, and it was finally disposed of, on the recommendation of a Special Committee, to the following effect:—
"That the Medal shall be of Gold, and that one be awarded annually.
"That the award shall not be limited to the recognition of any "particular class of contribution, but shall be made for any real "service done to Indian Agriculture, Horticulture or Floriculture, "or any other matter properly falling within the scope and objects "of the Society, which the Council may consider deserving of a special "mark of commendation."

At the suggestion of the President, the Society ordered out a set of Norton's Tube Wells, with the view of ascertaining if they could be successfully introduced into India for agricultural and horticultural purposes during the dry season. A set of three of these machines was received at the close of the year, and are now under trial.

Among various interesting communications which have been received during the past year, the Council would especially refer to those relating to certain enemies which the Tea planters of Assam have to contend against, in the shape of blight and a red spider, which cause such destruction to the plant. Specimens of plants blighted have been sent home to the Rev. J. M. Berkeley, the celebrated Cryptogamist, for identification, and a notice of the spider has been given by Dr. Stoliczka, of the Geological Museum. Other communications have also been submitted respecting the "Wood-boring Bee," so destructive to large trees; and to the "Shanko-poka," which occasions considerable damage to rice crops in Lower Bengal, and whose depredations in the Jessore district were particularly marked last year. Both these subjects were also referred to Dr. Stoliczka, who reported on them and pointed out what he considered would be the best mode of preventing the ravages of the last-named most destructive insect.

As usual, specimens of various products have been submitted to the Society for report, among them may be mentioned Silk from the Dehra Dhoon; Indigo from Arracan; Gums from Behar; Cotton from Mynpooree, Arracan, Assam, and the Soonderbunds; and Green Dye from Dinagepoor. Some papers on Cotton have been received from Mr. Rivett-Carnac, the Cotton Commissioner for the Berars and the Central Provinces; and lastly, from the Cape of Good Hope Agricultural Society, seeking the co-operation of this Society in their endeavours to introduce the culture of Silk in that Colony, which has been cordially responded to.

Only one Number of the Journal has been published during the year, *viz.*, Part 2, Vol. I. (New Series), which contains among other communications, a most interesting paper from the pen of Mr. John Scott, Curator of the Royal Botanical Gardens, Calcutta, on the higher *Cryptogams* cultivated in the Garden.

Statement of Receipts and Disbursements of the AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA, *from* 1*st January to* 31*st December* 1868.

RECEIPTS.

From Members, subscriptions collected during the year				24,207	0	9
,, Government Annual Donation				5,000	0	0
,, Accruings of Interest on Government Securities				665	5	4
,, Major R. Stewart, for gram, wheat, and potatoes, &c.	700	0	0			
,, Secretary, Agricultural and Horticultural Society, Lahore, on account Medals	99	0	0			
,, Superintendent Port Blair, on account Seeds ...	200	0	0			
				999	0	0
,, Proceeds of Carolina Paddy	511	12	0			
,, ,, of Jute seed and Silk Worms' Eggs ...	3	8	0			
,, ,, of Fruit Grafts from the Nursery Garden	418	7	6			
,, ,, of a portion of surplus stock of English, American, and French vegetable and French and English flower seeds, and acclimated flower seeds	2,773	0	0			
,, Proceeds of copies of Publications of the Society	77	2	0			
,, ,, of a copy of Fenwick's Hand-book ...	2	0	0			
,, Members, amount for glazed cases, pots, packing charges for seeds, &c.	1,318	9	6			
,, Amount repaid for freight on boxes of seeds forwarded in 1867-68	293	4	3			
,, Sundry receipts by sale of boxes, &c.	19	6	0			
,, Establishment refund	3	0	0			
				5,420	1	
Total Receipts, Rupees				36,291	7	4
Balance in the Bank of Bengal on 31st December 1867	766	6	3			
Do. in the hands of the Secretary on ditto ...	94	3	8			
				860	9	11
Grand Total, Rupees				37,152	1	3

DISBURSEMENTS.

By Messrs. James Carter & Co., for seeds supplied in 1866, 1867, and in part for 1868 ...	8,559	6	5			
,, Messrs D. Landreth & Sons, for seeds supplied in 1867	3,031	9	3			
,, Messrs Vilmorin, Andrieux & Co., for French flower seeds supplied in 1867	512	12	9			
,, Messrs Law, Somner & Co., for Agricultural seeds supplied in 1867-68	1,186	10	6			
,, Dr. Forbes Watson for Carolina paddy seed forwarded in 1867	465	15	3			
,, Sundry parties for gram, wheat, and potatoes ...	657	11	0			
,, Ditto for Native vegetable seeds, &c. ...	100	0	0			
				14,514	1	2
LIBRARY.						
,, Books purchased for the Library	90	14	0			
,, Binding books	37	8	0			
				128	6	0
PRINTING.						
,, Sundry parties for printing receipts, letter of call, lithographing of Council notice, code of Bye-Laws, &c. &c.				104	8	0
Carried over ...				14,746	15	2

Brought forward ...				14,746	15	2

JOURNAL.

By Bishop's College Press for printing, &c., 700 copies of Journal, Parts 1 and 2, Vol. I, New Series...	863	2	3			
,, City Press for printing 700 copies of Monthly Proceedings, from July to December 1867 ...	133	1	0			
,, H. H Locke, Esq., for drawing and engraving on wood for Journal	21	0	0			
				1,017	3	3

NORTON'S TUBE WELLS.

By Dr. J. Forbes Watson for 3 Norton's Tube Wells,	...	...		416	10	0

NURSERY GARDEN.

,, Ordinary expenses incurred on account of the Nursery Garden, from 1st December 1867 to November 1868	3,576	12	6			
,, Extra expenses incurred for purchase of fruit seedlings for grafting, for glazed cases, pots, bell-glasses, &c.	809	13	3			
,, Howrah Municipality for Assessment on Society's Garden, from July 1867 to March 1868 ...	168	12	0			
,, James Garaway & Co., for Rose plants supplied in 1866	225	0	9			
,, C. K. Hudson, Esq., for 41 baskets of Orchids from Cherrapoonjee	299	0	0			
				5,079	6	6

ESTABLISHMENT.

,, Amount for Establishment, from 1st December 1867 to 30th November 1868	...	...		10,352	3	6

ADVERTISEMENTS.

,, Advertising notices of General Meetings, of Shows of Vegetables and Flowers, and distribution of Seeds	...	...		361	14	0

MISCELLANEOUS.

CART.

,, Wood for frame-work of a Cart for seed distribution	...	...		4	14	0

FREIGHT.

,, Freight on boxes of Seeds, Books, &c., sent and received from America, England, France, and Melbourne	...	...		913	10	5

PECUNIARY REWARDS.

,, Prizes to mallees for Vegetables and Fruits at Exhibition, held on 15th February 1868 ...	276	0	0			
,, Ditto ditto for Flowers at ditto, on 15th February 1868	257	0	0			
				533	0	0

FURNITURE, &c.

,, Sundry articles of Furniture	146	2	0			
,, A. Grote, Esq., for his Portrait	500	0	0			
				646	2	0
Carried over ...				34,071	14	10

Brought forward				34,071	14	10
METCALFE HALL.						
„ Society's proportion of Assessment, from October 1867 to September 1868	324	0	0			
„ Do do for Lighting and Police, from October 1867 to September 1868	180	0	0			
„ Burn & Co., for petty repairs	8	13	0			
				512	13	0
STATIONERY.						
„ Stationery for Office, Books, &c	103	9	6			
„ Brown packing Paper for packing seeds	81	0	0			
				184	9	6
PETTY CHARGES.						
„ Sundry charges including Postage on letters, &c, sent and received, and for copies of the Journal ..	880	13	1			
„ Extra Writers and Packermen for sub-dividing and writing on seed papers, &c, for soldering tin boxes sent to non-resident Members, and for other petty charges	289	12	0			
„ Sundry parties for pitching tents, and breakfast, for Exhibition of Vegetables and Flowers, on 15th February 1868	260	10	0			
„ Grindlay & Co, balance of their account, dated 1st January 1868	35	0	6			
„ Secretary, Bank of Bengal, for renewing Promissory Notes, and for Commission for drawing Interest on Government Securities	3	10	8			
				1,469	14	3
				36,239	3	7
Balance in the Bank of Bengal on 31st December 1868	869	7	1			
Do. in the hands of the Secretary, on ditto ..	43	6	7			
				912	13	8
Grand Total, Rupees ...				37,152	1	3

MEMORANDUM.

DISBURSEMENTS.

To Amount of Disbursements during the year 1868 as per Statement..				36,239	3	7
„ Balance in the Bank of Bengal on 31st December 1868	869	7	1			
„ Ditto in the hands of the Secretary on 31st December 1868.	43	6	7			
				912	13	8
Total, Rupees ...				37,152	1	3

RECEIPTS.

By amount of Receipts during the the year 1868, as per Statement				36,291	7	4
„ Balance in the Bank of Bengal on 31st December 1867	766	6	3			
„ Ditto in the hands of the Secretary on the 31st December 1867	94	3	8			
				860	9	11
Total, Rupees ..				37,152	1	3

LIABILITIES.

English vegetable seeds of 1868	£135	11	5
American vegetable seeds of 1868, $1,963=	£400	0	0
French vegetable and flower seeds for 1868,	£498	1	10
Total ...	£1,033	13	3

DEPENDENCIES.

Amount invested in Government Securities lodged in the Bank of Bengal ... Rs.				16,633	5	3
Ditto of Subscription in arrear	Rs. 10,839	7	0			
Ditto outstanding for seeds, grafts, copies of Journal, &c. &c. .	Rs. 2,199	8	3			
				13,038	15	3

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31*st*, 1868.

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

Office Bearers.

President.

J. A. CRAWFORD, ESQ.

Vice-Presidents:

S. H. ROBINSON, ESQ.
COWR HARENDRA KRISHNA BAHADOOR.
S. JENNINGS, ESQ.

Secretary and Treasurer;

A. H. BLECHYNDEN, ESQ.

Members of Council;

T. H. MOSLEY, ESQ.
DR. C. FABRE TONNERRE.
MAJOR W. N. LEES.
BABOO PEARY CHAND MITTRA.
HON'BLE J P. NORMAN.
C. WESKINS, ESQ.
W. STALKARTT, ESQ.
A. H. MOWBRAY, ESQ.
M. HENDERSON, ESQ.
E. BROUGHTON, ESQ.
L. BERKELEY. ESQ.
DR. T. ANDERSON.

Patron:

HIS EXCELLENCY THE RIGHT HON'BLE SIR JOHN LAWRENCE, BART.

List of Members.

* This Mark denotes Members who have compounded for their Annual Subscriptions.

† This Mark denotes Members who are absent from India, and therefore Non-contributors.

‡ This Mark denotes Members who, though absent, are desirous of continuing their Subscriptions.

HONORARY MEMBERS.

The Right Honorable Sir Edward Ryan, A. M., F. A. S., London, ...	1828	1841
Colonel John Colvin, C. B., London, ...		1830
J. Mackay, Esq., ...		
Don Ramon de la Sagra, Island of Cuba, ..		
Dr. Justus Leibig, Professor of Chemistry in the University of Giessen, ...		1843
The Right Honorable Sir Lawrence Peel, London,	1842	1856
R. Fortune, Esq., ...		1856
Sir Arthur Buller, ...	1849	1859
A. Grote Esq.. London, ...	1837	1868
The Rev. T. A. C. Firminger, London,.. ..	1851	1868

CORRESPONDING MEMBERS.

D. J. Macgowan, Esq., M. D. Ningpo, ...	1851
Mons. Natalis Rondot, Paris, ...	1858
Capt. Thos. Hutton, F. G. S. Mussoorie, ..	1861
Lt.-Coll. W. H. Lowther, Berhampore, ...	1864
James Cowell Esq., London, ...	1864
Dr. H. Cleghorn, Edinburgh, ...	1867
Dr. A. C. Maingay, Rangoon, ...	1868

ASSOCIATE MEMBERS.

Capt. E. P. Nisbet, London, ...	1842
Mr. John Scott, Curator, Royal Botanic Garden, Calcutta, ...	1866

ORDINARY MEMBERS.

	Admitted.
ABBOTT, Horace Esq., Rajahpore viâ Koosteah,	1858
Abbot, Liut. Colonel J. R. Calcutta,	1865
Abdool Gunny, Kajee, Zemindar, Dacca,	1860
Achard,† Lewis Frederick, Esq., Merchant,	1862
Ackland,† C. J. Esq., Merchant,	1855
Adams, J. H. Esq , Tea-planter, Seebsaugor, Assam,	1867
Adey, Dr. Arthur, 15th Bombay N. I. Mhow,	1868
Ady, Charles Esq., Merchant, Moulmein,	1864
Agabeg, J. Esq., Merchant, Calcutta,	1858
Agabeg, A. L. Esq., Merchant, Calcutta,	1860
Agabeg, Malchus, Esq., Advocate, Rangoon,	1866
Ainslie, W. Esq., Civil service, Patna,	1847
Alexander, F. J. Esq , Civil service, Rampore Beauleah,	1862
Alexander, R. Esq., Civil service, Cuttack,	1864
Alexander, N. Stuart, Esq., C. S. Mymensing,	1864
Alexander, W. Esq., Merchant, Calcutta,	1865
Alexander, Lt. Coll. W. R. E. Commanding 1st Bengal Cavalry, Seepree,	1867
Alexander, Capt. F. J., Invalid Establishment, Mussooree,	1867
Allen,† Thomas, Tayler, Esq., Civil service,	1866
Allowallea,* Rajah of Kapoorthullea, Jullunder,	1853
Amesbury, Dr. W. R. 1st Bengal Cavalry, Seepree,	1865
Anderson, P. Esq., Merchant, Calcutta,	1854
Anderson, Thomas, Esq., M. D. F. L. S. Superintendent, Royal Botanic Garden, Calcutta,	1861
Anderson, Lt. Col. W. W. (1st Bombay Lancers) Supt. H. H., the Guicowar's Contingent of Horse, Manickwama, Kattywar,	1859
Anderson, Dr. J. Curator Impl. Museum, Calcutta,	1865
Anstruther, Hamilton, Esq , Marchant, Calcutta,	1867
Armstrong, C. M. Esq., Opium Dept., Gazeepore,	1858
Armstrong, T. W. Esq.. Supg. Engineer, Kamptee, Central Provinces,	1862
Armstrong, J. S. Esq., C. S. Cuttack,	1865
Ashburner, Major John, (Bombay Staff-corps) Depy. Commissioner, Chindwarah,	1864
Ashworth,† W. A. Esq.,	1865
Atkinson, W. S. Esq., Director Public Instruction, Calcutta,	1864
Anley, George Esq., Civil Engineer, Julpigoree,	1861
Auchidzky, P. Esq., Merchant, Akyab,	1864
Austen, Capt. Godwin, Survey Dept., Cherra Poonjee,	1867
BADGER, A. Esq., Manager Equitable Coal Company's Colliery, Choukeedangah, Ranneegunge,	1866
Bainbridge,† Herbert Esq., Tea-Planter,	1862

	Admitted
Bainbridge, Reginald, Esq., Tea-Planter, Gowhatti,	1867
Bainbridge, A. R. Esq., Civil service, Dinagepore,	1868
Baird, Major A. F. Executive Engineer, Hazareebaugh,	1861
Baker, Thomas Esq., Anjooree Tea-Plantation, Jorehaut,	1864
Balfour,† G. G. Esq.,	1844
Balfour,† H. Esq., C. S.	1865
Banister, Dr. G,; F. R. C. S., Govr. Genls. Body Guard; Debra Dhoon,	1868
Banziger, J. C. Esq., Merchant, Calcutta,	1868
Barlow,‡ G. N. Esq., Civil Service,	1864
Barnes, H. B. Esq., Superintending Engineer, P. and O. Co's. Service, Garden Reach,	1866
Barnes, C. H. Esq., Darjeeling,	1868
Barrow,† T. Esq., Solicitor,	1866
Barry,† Dr. J. B.,	1856
Barstow, H. C. Esq., Civil service, Etah,	1868
Bartlett, Major H. T. Bengal Staff Corps, Saugor,	1865
Baugh, Lt. Col. F. W. Conservator of Forests, Nynee Tal,	1855
Baumgarten, F. Esq., Hukla Valley Estate, Chittagong,	1865
Bayley, E. C. Esq., Civil service, Calcutta,	1863
Bayley, Stuart Colvin Esq., Civil service, Calcutta,	1859
Beadon,† Sir C.,	1855
Beadon, Henry, Esq , Civil Service, Kooshteah,	1867
Beaufort, Francis L. Esq., Civil service, Calcutta,	1838
Becher, William, Esq., Gowhatti,	1855
Becher, J. M. Esq., Indigo-planter, Tewalah factory viâ Durbangah, Tirhoot,	1862
Beeby, G. O. Esq., Solicitor, Calcutta,	1866
Begg,‡ Dr. D.,	1850
Bell, W. H. Clarke, Esq., Indigo Planter, Coxially, Nuddea	1867
Bell, H. Esq., Civil Service, Nuddea,	1867
Belli, C. H. Esq., Rampore, Bauleah,	1863
Bennertz, T. H. Esq., Merchant, Calcutta,	1868
Benson, Coll. J. C., A. C. G. Rangoon,	1863
Benson, George, Esq., Pleader, High Court, N. W. P., Bareilly,	1868
Bentall,*† Edward. Esq., Civil Service,	1837
Berrill, J. M. Esq., District Supt. of Police, Nursingpore,	1866
Berkeley, L. Esq., Comr. Paper Currency, Calcutta,	1855
Bertelson, H. H. F. Esq., Tea-planter, Mohurgong, Darjeeling,	1868
Betts, C. G. D. Esq., Ourungabad via Pakour,	1867
Beveridge,† H. Esq., C. S.	1865
Bhowany, Sing,* Maharajah, Duttea,	1864
Bignell, R. A. D'O Esq., Asst-Supt-of Police, Balasore,	1867
Bindabun Chunder Mittra, Baboo, Calcutta,	1853
Birch, Capt. R. G. Fort Adjutant, Fort William, Calcutta,	1867

	Admitted.
Bishop,*† Major H. P. (Artillery,)	1853
Blacker, G. M., Esq., Merchant, Calcutta,	1856
Blechynden, R. Esq., Merchant, Calcutta,	1858
Blechynden, A. H. Esq., Secy. Agri-Hort. Society of India, Calcutta,	1851
Boileau, Major Neil; D. J., A. G. Brocklands, Murree,	1865
Bonavia, E. Esq., M. D., Assist. Surgeon, Lucknow,	1859
Bond, F. Esq., Executive Engineer, Cuttack,	1867
Booth, Dr. B. S., Mozufferpore, Tirhoot,	1867
Bouchier, Brigr. Genl. G; C. B., Royal Artillery; Dinapore,	1868
Boulderson,† A. Esq., Civil service,	1865
Bourne, Walter, Esq., Resident Engineer, E. I. Railway, Assensole viâ Raneegunge,	1855
Bowser, H. C. Esq., Civil Surgeon, Rungpore,	1865
Brae, T. Esq., Dobracole, Commercolly viâ Keosteah,	1854
Brandis, Dr. D., Supt. of Forests, Lahore,	1857
Brander,† James, Esq., E. B. Railway,	1865
Brice, N. Esq., Dinapore,	1859
Bridgman, J. H. Esq., Gorruckpore,	1868
Brine, F. B., Esq., Jellalabad, Rohilcund Trunk Road, viâ Futteygurh,	1863
Brock, Charles Esq., Merchant, Calcutta,	1867
Brodhurst, M. Esq., Civil service, Benares,	1859
Brodie,*† Major T.,	1836
Broome, Col. Arthur, Royal Artillery, Calcutta,	1864
Broucke, W. J. Esq., Indigo-planter, Loureah Factory, Betteah,	1859
Brougham, Dr. J. P. Presidency Surgeon, Calcutta,	1867
Broughton,† Capt. W. E. Delves, 44th N. I.,	1866
Broughton, E. Esq., Merchant, Calcutta,	1865
Brown, H. F. Esq., Merchant, Calcutta,	1867
Brown, Dr. Robt. Political Agent, Munneepore,	1868
Browne, Lord Ulick, Civil service, Chittagong,	1867
Browne,† J. F., Esq.,	1862
Browne, Rev. J. Cave, Kidderpore,	1866
Brown, Forbes Scott, Esq., Merchant, Penang	1840
Brown,† Lieut. Col. D., 1st Madras Fusiliers,	1856
Browning, Fred. R. Esq., Civil Engineer, E. I. R. Chord Line, Seetakotta, viâ Assensole,	1867
Brundell,† R. S., Esq., Resident Engineer E. I. Railway,	1862
Buchanan,† George, Esq., Merchant,	1862
Buckingham, J. Esq., Tea-planter Cachar,	1867
Bullen,† John, N. Esq.,	1859
Buller,*† Frederick Pole, Esq., Civil service,	1837
Burbank, Capt C., Emigration Agent, Calcutta,	1863
Burgett, C. F. Esq., Merchant, Calcutta,	1863

	Admitted.
Buskin, E. G. Esq , Calcutta,	1864
Butt, Geo. Esq., Civil service, Shajehanpore,	1866
CAMERON, Dr. J. McLeod, Civil Surgeon, Monghyr,	1865
Campbell, Alxer. S. Esq., Managing, Proprietor, Western Assam Company, Luckimpore,	1863
Campbell,† W. F. Esq.,	1838
Campbell,*† Archibald, Esq., M. D.	1838
Campbell, John Colin, Esq., Calcutta,	1864
Campbell, Archd. Esq., Assist. Commr. Gowhatti,	1861
Campbell,† Honble. Geo., Civil service,	1865
Carbery, R. J., Esq., Indigo-planter, Cannington, Allahabad,	1865
Carew,* R. R. Esq.,	1846
Carleton, C. H. Esq., Indigo-planter, Belwah, Chumparun,	1868
Carnac, C. F. Esq., Civil service, Ghazeepore,	1865
Carnegy, P. Esq., Asst.-Commissioner, Fyzabad,	1857
Carrick, Henry Esq., Locomotive Supt. E. I. Railway, Jamalpore,	1863
Castle, C. T., Esq., Supt. of Police, Banda,	1865
Cavenagh,† Liut-Colonel, O., Governor of the Straits Settlements,	1848
Chalmers, Major S , Depy Asst. Comy. Genl., Mean Meer,	1865
Chambers, Charles, Esq., Civil Engineer, E. I. Railway, Luckeeserai,	1868
Chamberlain, Major Chas. 1st. Bengal Cavalry, Nowgong, Bundlekund,	1859
Chapman, R. Esq., Merchant, Umritsar,	1867
Chardon, W. B. Esq., Doudnaggur, Shahabad,	1864
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Mills,*† Andrew John Moffat, Esq.	1836
Minchin, F. J. V. Esq., Aska,	1862
Minchin, Charles Esq., Merchant, Bimlipatam,	1864
Minto, Wm. Esq., Dehra Dhoon,	1862
Mitchell, R Esq , Merchant, Calcutta,	1868
Moffat, Lt. Col. A. K., Lucknow,	1865
Moharajah, of Cooch Behar,	1864
Moharajah, of Bhurtpore,	1865
Mohr, Edward, Esq., Merchant, Arracan,	1857
Molony, E. Esq., C. S., Cuttack,	1865
Money,*† William James Henry Esq., Civil service,	1836
Money, Capt. R. C. Deputy Commr. Maunbhoom,	1867
Monteath, A. M. Esq., Director General of Post Offices, Calcutta,	1868
Moore, C. W. Esq., C. S. Azimghur,	1865
Morrel, R. Esq , Zemindar, Backergung,	1853
Morris, J. H. Esq., Civil service, Nagpore,	1863
Mosely, T. H Esq., Merchant, Calcutta,	1862
Moultrie, G. W. Esq., Banker, Calcutta,	186[illegible]
Mountjoy, Dr. J. W., Akyab,	1864
Mowbray, Arthur H. Esq., Merchant, Calcutta,	1866
Murray, Col. J. J. Commandant 14th Bengal Lancers, Meerut,	1867
Muspratt, J. R. Esq., Civil service, Purnea,	1847
Naesmyth, J Esq., Civil service, Hissar,	1852
Nawab, Nazeer Ally Khan Bahadoor, Calcutta,	1862
Nedham, Lieut. Col. A. G. Staff Corps, Agra,	1868
Nembhard,† Major Wm.,	1861
Nelson,† J. B. Esq . Civil Engineer,	1863

	Admitted.
Nickels, C. Esq., Indigo Planter, Jaunpore,	1866
Nicolson, D. G. Esq., Barrister-at-Law, Moulmein,	1864
Nobin Chunder Nag, Baboo, Zemindar, Midnapore,	1866
Norman, Honorable J. P. Judge of the High Court, Calcutta,	1865
Nuthal, R. D. Esq., Assistant Supt. Kheddahs, Belaspore, viâ Nagpore,	1858
Nuthall, Genl. W. F. Commg. Eastern Frontier District, Shillong, Khassia Hills,	1867
OBOYCHURN Goho, Baboo, Merchant, Calcutta,	1856
Ogbourne, C. H. Esq , Calcutta,	1867
Ogg, A. A. Esq., Calcutta,	1862
Ogilvy,† J. F. Esq , Merchant,	1865
Oldham,† Lieut, H. G.,	1863
Oldham, Wilton Esq., L. L. D., Civil service, Ghazeepore,	1867
Onraet, P. T. Esq , Bhaugulpore,	1857
Orr, J. Cave Esq., Solicitor, Calcutta,	1868
Orr, Major Alexander, P. Roy Bareilly, Oude,	1868
Osborne, Major Willoughby, F. R. G. S., F. G. S., Political Agent in Bhopal, Sehore,	1862
Owen Lt. Col. W. G., (11th Madras, N. I) Moulmein,	1846
Owen Lt. Col. A. W. Executive Engineer, Jhansie,	1865
PALLISER, Major C. H., Commanding 10th Bengal Cavalry, Saugor,	1860
Palmer, Charles, Esq , Medical service, Calcutta,	1848
Palmer, A. V., Esq., Civil service, Monghyr,	1858
Palmer,* T. A. G., Esq., Cawnpore,	1861
Park, Robert Esq., Indigo-planter, Bhaugulpore,	1865
Parish, Rev. Charles, Chaplain of Moulmein,	1856
Parrott, Lt. Col. B., Stud. Deptment., Buxar,	1867
Pasley, G. B. Esq., Civil service, Ghazeepore,	1867
Paterson, Captain John, Supt., P. and O. Company, Calcutta,	1865
Patterson, A. B. Esq , C. S. Joint Magistrate, Boolundshohur,	1868
Payne, Dr. A. J., Medical service, Calcutta,	1860
Payter,‡ G. R. Esq., Indigo-planter, Dinagepore,	1861
Peacock, the Honorable Sir Barnes, Chief Justice, High Court, Calcutta,	1852
Peal, S. E. Esq., Tea-planter, Seebsaugor, Assam,	1867
Peary Chund Mittra, Baboo, Secretary Public Library, Calcutta,	1847
Peary Mohun Banerjee, Baboo, Pleader High Court, N. W. P. Allahabad,	1868

	Admitted.
Peddie, Graham, Esq, District Engineer, E. I. Railway, Allahabad,	1865
Pellew, F. H. Esq,, Civil service, Burrisaul,	1863
Pendleton,† A. G. Esq., Agt. S. E. Railway,	1865
Peppe, T. F. Esq, Gya,	1868
Perkins, Dr. R. H., Benares,	1859
Perrin, Monsieur J., Silk Filatures, Berhampore,	1859
Pertap Narain Sing, Baboo, Depy. Magt. Bood bood,	1863
Pester, Lieut. Col. Hugh L., 9th Reg. N. I. Barrackpore,	1862
Peterson, A. T. T. Esq, Barrister, High Court, Calcutta,	1849
Peterson, Frederick Esq., Secy. Simla Bank, Simla,	1862
Phear, the Hon'ble. J. B., Calcutta,	1867
Phillippe, Clement Esq, Indigo-planter, Balacole, Pubna,	1851
Phillips,† James Esq., Indigo-planter,	1858
Pickance, Lt. Wm. John, Madras Staff Corps, Russelkundah, Ganjam District,	1867
Pigott, William Esq., Calcutta,	1864
Pittar, C. J. Esq, Solicitor, Calcutta,	1866
Place, H. J. Esq, Broker, Calcutta	1867
Platts, F. T. Esq., Superintendent of Police, Dacca,	1864
Pogose, J. G. N. Zemindar, Dacca,	1856
Pollok, Capt. F. T., (Madras Army) Executive Engineer Tonghoo, Burmah,	1860
Porter, G. E Esq., Civil service, Rungpore,	1863
Potit Pabun Sein, Baboo, Calcutta,	1865
Poulton, Major H. B. A., Bengal Staff Corps, Saugor,	1865
Power, Major, E. H., Depy., J. A. G., P. Dn. Rangoon,	1856
Prentis,† C. Esq., Civil Assistant Surgeon,	1866
Preonauth Sett, Baboo, Calcutta,	1852
Pringle, W. H. Esq., Superintendent Coal Depot, Ompta, *viâ* Moisraka,	1860
Prior, Col. Chas, Commanding at Dhurmsalla,	1867
Prosonnonarain, Deb.* Bahadoor, Roy, Dewan of His Highness the Nawab of Moorshedabad,	1859
Pyne, R. Esq., Purneah	1867
Quinton, J. W. Esq., Civil service, Fyzabad, Oude,	1865
Raban, Liut. Coll. H., Patna,	1858
Radharomun Dutt, Baboo, Calcutta,	1866
Rait, H. Esq., Gonatea, Synthia,	1866
Rajkissen Mookerjea,* Baboo, Landholder, Ooterparah,	1836
Ramanauth Tagore, Baboo, Calcutta,	1842
Ramanymohun Chowdry, Baboo, Zemindar, Rungpore,	1861
Ramessur Roy Choudry, Baboo, Zemindar, Allahabad,	1868
Ramsay, Coll. George Resident at Nepal,	1855
Ravenshaw, T. E. Esq., Civil service, Cuttack,	1865

	Admitted.
Read, Stephen, G. Esq., Surringa Indigo Factory, Gorruckpore,	1868
Rees,† Runtz, L. O Esq., Merchant,	1863
Redpath, R. Esq., Assist. Supt. of Police, Thatone, Moulmein,	1868
Reid,† F. Esq., Supt. of Irrigation;	1858
Reid, J. R. Esq., C. S. Officiating Deputy Commissioner, Azimgurh,	1866
Reinhold, H. Esq , Merchant, Calcutta,	1862
Rice, F. T. Esq. Noorpore Factory, Khamrah,	1866
Richard,*† J. Esq., Merchant,	1834
Richardson, R. J Esq., Civil service, Gya.	1859
Richardson, H. Esq., C. S. Comillah,	1865
Riddell,† H. B. Esq., Civil service,...	1855
Ridge. Wm. Esq., Furreedpore, viâ Berhampore,	1866
Rigby, Major Genl H., Royal Engineers, Barrackpore,	1868
Ripley,‡ Major F. W.,	1849
Robarts, Liut. Coll. Charles, Commandant 17th Bengal Cavalry, Seetapore,	1862
Robinson, S. H. Esq., Merchant, Calcutta,	1854
Robinson, J. Hamilton, Esq , Merchant, Calcutta,	1863
Robinson, Wm. Esq , District Engr. Delhi Railway, Jullundur,	1867
Rochfort, W. B. Esq., District Supt. of Police, Hooghly,	1868
Rogers, George Esq., Solicitor, Calcutta,	1858
Roghoonundun Sing, Rajah, Soorsund, Tirhoot,	1868
Roordur Purtab Sing,* Moharajah of Punna,	1868
Roodurpurshaud, Chowdry,* Nanpore, Tirhoot,	1867
Roquet, V. Esq., Indigo-planter, Moharajgunge Factory, Azimghur,	1860
Ross,† Alexander Esq., Civil service,	1858
Ross,‡ George Esq., Merchant,	1862
Ross, Mars Esq., Merchant, Calcutta,	1865
Row,† Major W. S. (33rd. N. I.,)	1854
Ruddock, E. Esq., B. C. S. Durbunga, Tirhoot,	1863
Rundle,† C. S. Esq., Civil, Engineer,	1862
Russell, A. E., Esq., Civil service, Burdwan,	1847
Russell, T. M. Esq., Calcutta.	1868
Ruxton, G., Esq., Merchant, Calcutta,	1861
Ryder, Major C. D. Jubbulpore,	1858
SAGE, R. P, Esq., Raneegunge,	1866
Sagore, Dutt, Baboo, Merchant, Calcutta, ...	1850
Samachurn Law, Baboo, Merchant, Calcutta,	1855
Sandeman, H. D. Esq , Civil service, Calcutta,	1863
Sarodaprosono Mookerjee, Baboo, Goverdanga,	1865
Savi, J. R. Esq., Indigo-planter, Nohatta, Jessore,	1862

	Admitted.
Savi, Thomas, Esq., Indigo-planter, Kishnaghur,	1851
Schiller, F, Esq., Merchant, Calcutta,	1854
Schmidt,† C K. Esq., Merchant,	1865
Searles, Major, Geo. A. Madras Staff Corps, Excutive. Engr. Irrigation Dept. Kishnaghur,	1868
Secretary Local Committee, Mynporee,	1850
Secretary, Local Fund Committee, Umritsur,	1859
Secretary Local Committee, Hummeerpore,	1859
Secretary Local Fund Committee, Ferozepore,	1861
Secretary Public Garden, Banda,	1855
Secretary Public Garden, Monghyr,	1853
Secretary Public Garden, Cawnpore,	1860
Secretary Agri. and Hort. Society, Saugor,	1863
Secretary Agri. and Hort. Society, Bhaugulpore,	1864
Secretary Cantonment Public Gargen, Agra,	1865
Secretary Local Fund Committee, Goergaon,	1865
Secretary Assam Company, Calcutta,	1865
Secretary Public Garden, Jaloun, Oorai,	1866
Secretary Govt. Garden, Muttra,	1866
Secretary Local Committee, Chindwarrah,	1867
Secretary Local Committee, Jahnsie .	1867
Secretary Road Fund Committee, Jauupore,	1867
Secretary Port Canning Company Ld. Calcutta,	1868
Seton-Karr, Honble., W. S. Civil service, Calcutta,	1859
Shaw, D. T. Esq., Merchant, Calcutta,	1865
Sheanundan Sing Rajah, Shohur District, Chuprah,	1863
Shearin, E. Esq., Merchant, Calcutta,	1856
Sheridan, A. J. R. Esq., M. D., Soory,	1860
Sherriff, W. Esq., Jorrada, Jessore...	1859
Sheodial Sing,* H. H. Mohakhan, Rajah of Alwar,	1863
Shewell, Lieut. A. M., Commissariat Dept., Nusseerabad,	1867
Shib Chunder Sircar, Zemindar, Kirin-nahar, Thanah Shacoolipore, District Beerhoom,	1865
Shillingford G. W. Esq., Kolasay Factory, Purneah,	1867
Shore,† R. N. Esq , Civil service,	1865
Shortt, T. H. H. Esq.; Civil service, Midnapore,	1866
Showers, Lieut. Coll. C. L., Gwalior,	1863
Simons, C. J. Esq., Tea-planter, Nazeera, Assam,	1863
Simpson, B. Esq., Civil Surgeon, Darjeeling,	1863
Simson,† James Esq , Civil service,	1856
S[illegible]som, D. Esq., Civil service, Lahore,	1854
Skene,† Capt. J. G., H. M's 77th Regiment,	1862
Skinner, A. Esq., Hansi,	1854
Skinner, Capt. R. M. District, Supt. of Police, Shillong and Cossya Hills,	1868
Skipton, D. P. Esq.; Jessore,	1865

	Admitted.
Sladen, Joseph Esq., Supt. of the Dehra Dhoon.	1867
Smalley, R. B., Esq., Assist. Supt. Bengal Police, Soory, Beerbhoom,	1867
Smart, Arthur D. Esq., Jorehaut, Assam,	1865
Smeaton, Geo. Esq., Civil service, Jajipore viâ Balasore,	1867
Smith, J. J. White, Esq., Indigo-planter, Kattulee, Kishnaghur,	1854
Smith,† R. H. Esq., Principal Sudder Aumeen,	1860
Smith, Jas. Esq., Shahpore, Tirhoot,	1863
Smith, Thomas T. Esq., Rampoorah Factory, viâ Jeagunge,	1864
Smith, C. M. Esq., Merchant, Calcutta,	1865
Smith, Rev. W. O'Brien, Calcutta,	1865
Smith, Rev. James, Delhi,	1866
Smith, Geo. Brown, Esq., Manager, Lacknah Tea Concern, Seebsaugor,	1866
Smith. W. H. Esq., Civil service, Allyghur,	1868
Snow,† Lieut. Coll. R., Deputy-Commissioner,	1862
Spankie, R. Hon'ble, Civil service, Agra,	1865
Spearman, Lieut. Horace, Assist, Commissioner, Rangoon,	1865
Spencer, C. J. Esq., C. E , E. I. Railway, Allahabad,	1863
Stack,† R. T. Esq., Solicitor,	1862
Stalkartt, William Esq., Merchant, Calcutta, (*Vice President.*)	1845
Stalkartt, J. Esq., Merchant, Calcutta,	1863
Stainforth, H. Esq., Ranchee,	1862
Steel, Donald Esq., Eastern Cachar Tea Company,	1861
Steel, Lieut. Coll. J. A. Bengall, Staff Corps, Roy Bareilly, Oude,	1868
Steer,† Hon'ble Charles, Civil service,	1853
Stephen, J. Esq., Dacca,	1855
Stephenson, Cecil Esq., Agent, E. I. Railway, Calcutta,	1866
Sterndale, R. A. Esq., Lahore,	1859
Stevens, R. F. Esq., Manager Hazrapore Concern, Jessore.	1866
Stevens, H. W. Esq., Executive Engineer, Durbangah,	1867
Stevenson,*† William Esq., Junior, M. D.,	1834
Stewart, A. N. Esq., Collector of Tolls, Jungypoor,	1862
Stewart, W. M. Esq., Dulsing Serai, Tirhoot,	1859
Stewart,† Captain John. Depy. Com. of Ordnance.	1860
Stewart, R. D. Esq., Merchant, Calcutta,	1863
Stewart, Dr. J. L., Conservator of Forests, Punjaub,	1864
Stewart, Major, F. G., District Supt. of Police, Nagpore,	1865
Stewart, Robert Esq., Merchant, Calcutta,	1867
Stewart, E. Esq., Deputy Magistrate, Mudhypoora, Bhagulpore,	1867
Stewart, Major, R. Deputy Commissioner, Luckimpore, Assam,	1868
Stirling, B. Esq., Allipore,	1866

	Admitted.
Stokes, Allen Esq., E. I. Railway, Jumalpore,	1867
Stocks, J. W. Esq., Berhampore,	1866
Stoney, R. V. Esq., Civil Engineer, Hidgelee,	1866
Story, Major General F. P , C. B., Nynee Tal,	1854
Strachey,† Liut. Coll. R., (Engineers,)	1857
Stuart, Alex. Esq., Raneegunge,	1863
Stubbs, Lieut Coll. W. H , 4th Regt. N. I. Allahabad,	1868
Stretell, G. W., Esq., Forest Department, Sind,	1867
Sturmer, Edwin Esq., Assistant Engineer, Canning Town, Mutla,	1863
Surmer, John, Esq., Civil Engineer, Calcutta,	1864
Sturmer, A. J., Esq.; Talooka Kojha, viâ Gazeepore,	1866
Supt. of Jorehaut Tea Company, Assam,	1865
Supt. of the Queen's Gardens, Delhi,	1865
Supt. Northern Assam Tea Comany,	1865
Supt. Serajgunge Jute Company, Serajgunge,	1868
Sutherland, Charles J. Esq., Merchant, Calcutta,	1828
Sutherland, Dr John, Civil Surgeon. Barrackpore,	1859
Sutherland,† H. C. Esq , Civil service,	1860
Suttoshurn Ghosal, Rajah Bahadoor, Calcutta,	1856
Swinden, T. G. Esq., Calcutta,	1855
Swinhoe, William Esq., Attorney, Calcutta,	1859
Syooddeen Ahmud Allee Khan, Bahadoor Nawab of Moorsed,	1868
Syud Ahmed Ally,† Nawab,	1864
TANNER, J. E. Esq.; Delhi Railway, Loodianah,	1866
Tarruck Nauth Dutt, Baboo Calcutta,	1866
Taylor, G. B. Esq., Mussooree,	1858
Taylor,† V. T. Esq., Civil service,	1860
Taylor, W. C. Esq., Cuttack,	1858
Taylor, Hon'ble G. N. Civil service, Calcutta,	1865
Taylor, Frank, Esq. Executive Engineer E. I. Irrigatien and Canal Company, Hidgelee,	1868
Tennant, Major T. E. Deputy Inspector Genoral of Police, Waltair, Vizagapatam,	1868
Terry, W. Esq., Indigo-Planter, Midnapore,	1846
Thelwall, Major J. B., C. B., Meean Meer,	1851
Thomas, R. M. Esq., Solicitor, Calcutta,	1849
Thomas, J. Esq., Merchant, Calcutta,	1867
Thomas J. P. Esq., Merchant, Calcutta,	1868
Thompson,† Major E., Deputy-Commissioner,	1856
Thompson, Liut. Coll. E., Political Agent of Indore,	1864
Thompson,† Rivers Esq., Civil service,	1864
Thompson, Dr. R. F., Hooghly,	1865
Thompson, J. H. Esq., District Supt. of Police, Balasore,	1864
Thomson,† Ninian Esq., Judge S. C. Court,	1862

	Admitted.
Thomson, Walter Esq., Merchant, Behea, Shahabad,	1862
Thorpe, J. Esq., Lucknow,	1867
Todd† J. E. Esq., Tea-planter,	1862
Tonnerree, Dr. C. Fabre, Health Officer, Calcutta,	1862
Tovey, Capt. J. T., Executive Engineer, Cawnpore,	1866
Trafford,† Rev. John,	1863
Trannath Chatterjea, Baboo, Calcutta,	1865
Tregear, Richd, Esq., Kolinjura, Jaunpore,	1866
Trevor† Edward Tayler Esq., Civil service,	1844
Tucker, W. T. Esq., Civil service, Bancoorah,	1855
Tucker, Robert Esq , Tea-planter, Seebsaugor,	1867
Tulloch, Capt. A., Dist. Supt. of Police; Rungpore,	1865
Turnbull, C. S. Esq., Silk Manufacturer, Ghuttal,	1853
Turnbull, J. D. Esq., Civil service, Meerut,	1865
Turnbull, Robert Esq., Merchant, Calcutta,	1865
Turner, H. B. H. Esq., Merchant, Calcutta,	1868
Twynam, Capt. E. J. L Executive Officer, Thayet Myo,	1856
Tytler, Coll. R. C., Simla,	1867
Vancutsem, E. C. Esq., Merchant, Calcutta,	1868
VEEN, W. Ter Esq., Merchant, Calcutta,	1864
Vertannes, J. C. Esq., Civil Engineer, Contai,	1865
Vizianagram, His Highness the Rajah, of	1847
Voss, C W. Esq., Merchant, Gopalpore,	1864
Voyle, Coll. G. E., R. A., Ishapore,	1868
WAGENTREIBER, W. Esq., Tea-planter, Debrooghur,	1857
Wagentrieber, W. J. H. Esq., Sonanie, Seebsaugor, Upper Assam,	1868
Walker,† G. A. Esq., Tea-planter;	1861
Walker, A. Esq., Merchant, Calcutta,	1867
Wallace, Adolphus Esq., Rungajaun Factory, Golaghaut, Assam,	1866
Waller, Capt. H. E. District Supt. of Police, Monghyr,	1865
Walters,* Henry Esq.,	1836
Walton, Lieut. Coll. B., Military Store Keeper, Calcutta,	1867
Warneford, Rev. T. L. J., Port Blair,	1866
Warner, Thornton Esq , Emigration Agent for Trinidad, Kidderpore,	1867
Waterfield,† E. Esq , Civil service,	1846
Wauchope, S. Esq., Civil service, Hooghly,	1848
Wavell, Wm. Esq., Civil service, Bograh,	1859
Webster, H. B. Esq., Civil service, Saharunpore,	1864
Webster, Geo. K. Esq., Civil service, Lohurdugga,	1866
Webster, Alexr. L. Esq., Jorehaut,	1867
Webber, F. V. B. Esq., Civil Surgeon, Dinagepore,	1868
Weinholt, John Esq.. Merchant, Calcutta,	1859

	Admitted.
Weinholt,† W. Esq., Merchant,	1848
Wemyss, Sir John, Bart, Mirzapore,	1859
Weskins, Charles Esq , Merchant, Calcutta,	1854
Westmacott, E V. Esq , C. S. Dinagepore,	1866
Weston, John Esq., Judge S. C., Court, Magoorah,	1863
Whampoa, Mr. Merchant, Singapore,	1850
Whitney, W. M. Esq., Merchant, Calcutta,	1860
Whitty, Irwin J., Esq., Civil Engr. E. I. Railway Chord Line, Sapha, viâ Raneegunge,	1867
Wickes, Haines Esq , Ex. Engr., Berhampore,	1866
Wight,*† Robert Esq., M. D.,	1836
Wilox, Frederick Esq., Bengal Police, Pooroolia,	1867
Wilkinson, Major A. E. Cantoment Magt., Fyzabad,	1862
Williams, Walter Esq., Supt. Dist. Police, Etah,	1867
Williamson, Major James, Commandant 26th Regt. N. I. Mehidpore, Central India,	1849
Williamson, Lieut. W. J , Asisst. Commr. Garrow Hills, Goalparrah, Assam,	1867
Williams, J. Esq , Agra,	1859
Wilmot, C. W. Esq., Asisst. Commissioner, Sonthal Purgunnahs, Rajmehal,	1859
Wilson, A. G., Esq., Deputy-Magistrate, Burhee,	1847
Wilson, Thomas Esq., Deputy Opium Agent, Gazeepore,	1848
Wilson, Charles Esq., Surgeon, 8th N. I., Allahabad,	1860
Wilson, Lient. Coll. H. M., Commdt. 31st P. N. I., Nowoshera,	1860
Wilson, C. H. Esq. Merchant, Calcutta,	1868
Wilson, R. H. Esq., Civil service, Patna,	1868
Windle, J. A. Esq. C. E. Executive Engineer, Balasore,	1865
Wingrove, Clement Esq.,	1865
Wintle, Charles F., Esq., Sub-Deputy Opinum Agent, Bustee, Goruckpore,	1859
Wintle, Coll. E. H. C., Cantonment Jt. Magistrate, Dum Dum,	1860
Wood, James M. Esq., Nagagollie, Debrooghur, Assam,	1865
Woodbridge,† Geo. Esq., Eastern Bengal Railway,	1867
Woodcock, Lient. E. M., District Superintendent of Police, Seetapore, Oude,	1864
Woodford, Dr. O., Calcutta,	1863
Woomes Chunder Roy, Zeminder, Norail, Jessore,	1867
Woopendra Nath Mittra, Baboo, Calcutta,	1867
Wordie, T. H. Esq., Merchant, Calcutta,	1863
Worgan, J. B. Esq , C. S. Offg. Joint Magistrate, and Collector, Purneah,	1868
Wright, H. Esq., Shapore, Punjaub,	1854
Wright, A. C. Esq., Deputy Magistrate, Jenida,	1865
Wright, Dr. Daniel, Residency Surgeon, Nepaul,	1866

	Admitted.
Wright, Wm. Esq., Judge Small Cause Court, Cuttack,	1866
Wright, S. Esq., Subordinate Judge, Dacca,	1867
Wroughton, Major H. R. Offg. Deputy Assist. Commissary General, Dinapore,	1860
Wyman, F. F. Esq., Calcutta,	1868
YATES, B. J. Esq., Station Master, E. I. Railway, Howrah,	1868
Young, Wm. Esq., Officiating Magistrate, and Collector, Boolundshohur,	1868

Monthly Proceedings of the Society.

Wednesday, the 20th January 1869

J. A. CRAWFORD, ESQ., *President, in the Chair*

THE Proceedings of the last Monthly Meeting having been read and confirmed, the Members proceeded, in accordance with the Bye Laws, to the election of Officers and Council for the current year. The President nominated Messrs. R. Blechynden and J. Lynam to act as scrutineers, who reported the result to be as follows:

President.—Mr J. A. Crawford, C.S.

Vice-Presidents.—Mr S. Jennings, F.R.H.S., Dr Thomas Anderson, F.L.S., the Hon'ble Sir Richard Temple, K.C.S.I., and Baboo Peary Chand Mittra.

Secretary.—Mr A. H. Blechynden.

Council.—Dr C. Fabre Tonnerre, Hon'ble J. P. Norman, Mr C. Weskins, Mr W. Stalkartt, Mr. A. [illegible] [illegible], Mr E. Broughton, Mr L. Berkeley, Mr S. H. Robinson, Cowar Harendra Krishna Bahadoor, Colonel E. H. C. Wintle, Mr A. Stirling, and Baboo Ramanath Tagore.

Standing Committees.—None of these Committees required strengthening, except the Committee of Papers, to which the name of Mr. L. Berkeley was added.

The Secretary read the Annual Report, which was adopted.

The ordinary business was then proceeded with, and the following gentleman, proposed at last Meeting, was elected a Member:—

The Hon'ble Sir Richard Temple, K.C.S.I.

The names of the following gentlemen were submitted as Candidates for election:—

Dr. C. T. Paske, Civil Surgeon, Mirzapore,—proposed by the Secretary, seconded by Mr Crawford.

Captain [illegible] Ward, 107th foot, Dum-Dum,—proposed by Mr S. Jennings, seconded by the Secretary.

Cowar Suttyanund Ghosal, Bhoykoylas,—proposed by Mr S. Jennings, seconded by Baboo P. C. Mittra.

C. Graf, Esq., Merchant,—proposed by Mr S. P. Griffiths, seconded by Mr J. G. Meugens.

The following contributions were announced:—

1.—Report on Insects destructive to woods and forests, by Mr R. Thompson, Assistant-Conservator, Gurhwal Forests,—from Government of India, P.W.D.

2.—Selections from the Records of Government, North-West Provinces, Second Series; Part 1,—from the Government of Bengal.

3.—Reports on Cinchona culture at Darjeeling and on the Theapreutical value of Cinchona Alkaloids, by Dr. Joseph Ewart,—from the Author

4.—Handbook of the Economic Products of the Punjab, Vol. 1, by Baden Powell, c s.,—from the Author.

5.—Sample of Cotton raised from Sea Island seed at Seetakotta, East Indian Railway, Chord Line,—from Mr. F R. Browning.

6.—Sample of Cotton raised from hybrid seed at Goosree,—from Mr. S. H. Robinson.

7—Sample of Cotton raised from New Orleans seed at Bholee Indigo Concern, on the Bhurtna station of the East Indian Railway Co., near Etawah,—from Mr. G H. Kearney

(Further particulars regarding these Cottons will be found in the body of the Proceedings)

It was proposed by Mr S H Robinson and unanimously agreed, that the President be requested to place himself in communication with the Private Secretary to His Excellency the Viceroy, with the view of requesting his Lordship's acceptance of the office of Patron of the Society, vacant by the departure of Sir John Lawrence.

Certain recommendations were submitted by the Council, with the view of avoiding unnecessary correspondence, and to arrive at a better understanding as to the privileges to which newly-elected Members, and Members rejoining the Society, will be entitled, and to equalize privileges with those enjoyed by Members paying subscriptions for the full year.

Baboo Peary Chand Mitter gave notice of motion in accordance with Chapter XIX of the Bye-Laws, that an additional Section be added to Chapter V. embodying the above recommendations

It was agreed that the Annual Show be held on Friday, the 12th February, provided a suitable site be obtainable.

TRIAL SOWINGS OF VEGETABLE AND FLOWER SEEDS.

The Secretary submitted a carefully drawn up and valuable report, and several illustrative tabular statements, from Mr John Scott, the Curator of the Royal Botanic Gardens, on the germination of the vegetable and flower seeds imported by the Society in 1868, and on a few of the latter, collected in the Botanic Gardens of Calcutta and Rungyroong, Darjeeling.

The Secretary also mentioned that he had received from Mr. Scott a list of Annuals, of which seed could be supplied from the Botanic Garden stock, and another list of really good, old and new, sorts which are likely to do well in our gardens

The Secretary further stated he had received several reports of a conflicting character in respect to the germination of the seeds imported last year—some of a favourable nature, others partially favourable, and others again very unfavourable. Among others he would allude to one from Mr. Clarke, of Bancoorah, whose trials had proved very unsatisfactory; the Rev. Mr. Parish, of Moulmein, had found the flower seed unexceptionally good, whilst he had been only partially successful with the vegetable seeds. Mr. Berkeley had informed him that his flower seeds had germinated most readily; a Member in Tirhoot had mentioned to him that he received his share of seeds at the same time as another Member resident in the same district; his friend put his seed into the soil at once, and they germinated readily; he placed his in an unsoldered tin box, which he had occasion to open frequently, and sowed some times afterwards, and the seeds did not germinate. Referring to Mr. Scott's remarks on the hurtful influence of the damp climate of Bengal, the Secretary drew attention to the foot-note in the Annual Report just submitted, from which it would be seen that additional steps had been already taken to secure the seeds from such exposure.

Mr. Jennings stated he had made trial sowings of the whole of the Australian seeds sent to the Society by Messrs. Law, Somner and Co., and all had germinated most freely. He would suggest that further attention be paid to this matter, with a view of ascertaining whether it would not be advisable to send those gentlemen a larger order.

After some conversation on the subject, it was resolved that a special Committee, consisting of Messrs. S. Jennings, W. Stalkartt, and L. Berkeley, be appointed to arrange for the next season's consignments.

COTTON.

Submitted the following reports by Mr. Joseph Agabeg, on the samples of Cotton from Messrs. Browning and Kearney previously alluded to:—

"I have examined the Cotton sent by Mr. Browning of Seetakotta on the Chord line of the East Indian Railway, a spot, as I am informed, about 12 miles from Burrakur. It was sent down in bolls. I have cleaned it in order the better to examine it. From its seed it is evidently of Sea Island stock, and its fibre much longer than Cotton grown in India from New Orleans seed. The pods are the largest I have ever seen, and the color excellent. Cotton raised in the Soonderbunds from Sea Island seed, has been shewn of a better and longer fibre, but not of equal strength to this sample, and I, therefore, consider it more profitable for the spinner, for when converted into twist it will shew a most favourable result. I also return the seeds and Mr. B.'s letter, from which I observe that the seeds were sown in September, and that the trees are now (December) 5 to 7 feet high, with from 80 to 130 pods on each plant. The soil of Seetakotta would, therefore, seem to be well adapted to this kind of Cotton, to shew such rapid growth and such a yield in so short a time as three months. I would recommend that a sample of the soil be analyzed to compare with that of the soil of St. Simon's Island, Georgia, on which Sea Island Cotton is grown. (See pp. 8 and 9 of Mallet's Book on Cotton.) If the soil be found to correspond with that of the best Sea Island spots in North America, that healthy part of Bengal (Seetakotta) might, by private enterprize, become a profitable Cotton-growing country, as labor from Hazareebaug and the Santal districts is readily procurable

"From its great strength and length, and its fine white color, I should price this Cotton at fully 12 pence a pound according to present valuations"

Mr. Kearney's Cotton.—"This is the best description and most useful Cotton according to the present wants of England; and consequently more desirable for cultivation than other kinds. The tree or plant, being hardy, stands our climate far better, and the produce from one tree is much more than from trees of other descriptions Mr Kearney may be requested to give us in his next the present height of the trees, and number of pods on it when in full blossom, and also to send us a sufficient quantity of pods that we may compare the size with others, as well as its weight.

"I value this sample at 10 pence a lb. according to the present prices of Cotton existing in England, and am prepared to offer Mr. Kearney twenty five (25) Rupees a maund for a thousand bales if he can cultivate and deliver the same in Calcutta this time, next year, provided he can clean as nicely as this sample, which is free of leaves, seed, yellow spots, &c., I remember to have seen similar kinds of Cotton turning up by a few bales out of a few hundred, as cultivated and packed by native merchants, but never witnessed a single Invoice separately packed to enable them to realise here its full value, and extend their cultivation, on the contrary, a few maunds have appeared one season and again disappeared in the next."

Read the following Memorandum from Mr. S. H. Robinson, in respect to the Cotton grown in his garden at Goosree —

"Herewith I send a sample of hybrid Cotton, grown in my garden here from seed obtained from Mr Grote's garden in June 1867. His plants which produced the seed I got, were raised from seed sent to the Society by Major Clarke in that year, of a hybrid variety between Sea Island and Bourbon. The sample I now send you is, therefore, a second descent from the original hybrid, I also send you a sample of the Cotton from Mr. Grote's garden, from which I separated the seed for comparison

"My object in the experimental cultivation was to see if this hybrid variety promised to be more suitable to the Bengal climate than other exotic kinds which have been tried. The seeds were sown as soon as I got them, in June 1867, and I raised about 20 plants, and these were getting into flower and pod in November 1867, when the Cyclone on the 2nd of that month laid them all prostrate, and I feared they were all destroyed. 14 plants, however, gradually recovered, and produced bolls during last rains, but not freely, and I saved only 40 bolls, of which my sample is the produce. These weighed 3½ oz., Cotton and seed, after separating the pod. I separated the fibre by Platt Brothers & Co.'s new patent roller gin, made with jute rollers, which, in as far as I could judge with so small a quantity, seemed to act very well; the proportion of produce was as nearly as possible one-third weight of fibre to two-thirds seed.

"You will observe that, although the length of staple and strength have deteriorated, the Cotton has preserved its soft, silky character and fine fibre. The Manager of the Goosery Cotton Mills, Mr. Morris, values it at 7½ pence per lb., taking Fair Bengal at 7 pence, and the original sample (Mr. Grote's) at 8 pence.

But I think the experiment is chiefly interesting from its shewing the great hardness of this variety, and its apparent suitability to the Bengal climate. The 14 plants are still strong and healthy, and are now throwing out more flowers. It is to be regretted that the Society have no garden in which to test further the cultivation, as I feel sure it is well worth a careful trial on a larger scale, for which I have neither space nor leisure."

Letters were read—

From Baboo Protabchunder Ghose, offering his best acknowledgments on his own behalf, and on behalf of the other members of his family, for the tribute of respect to the memory of his father, Roy Hurrochunder Ghose Bahadoor, paid at the last Monthly Meeting of the Society.

From H. Rivett-Carnac, Esq., Cotton Commissioner for the Central Provinces and the Berars, forwarding copy of a letter to the address of the Secretary, Chamber of Commerce, Bombay, regarding the area under Cotton cultivation this season, and the prospects of the crops in the Central Provinces and the Berars.

From the Secretary, Agricultural and Horticultural Society, Rangoon, thankfully acknowledging receipt of a collection of seeds of large trees which they are anxious to introduce into British Burmah.

From Major Paske, Deputy-Commissioner, Kangra, applying for copies of the publications of this Society for the use of the Library and Institute, now being established at Dhurmsala. Complied with.

EXHIBITION OF RARE PLANTS.

The following plants were submitted for competition —

From Mr. John Lynam's garden — A fine, healthy plant, in flower, of *Saccolabium giganteum*, received from Burmah 9 months ago, quite a novelty; ten marks awarded.

From Mr. A. H. Mowbray's garden.—Two new Roses, "Louise de Savoir" and "Charles Verdier," and a plant of *Eria* (*lanata*)—four marks awarded for each of the Roses.

From Mr. S. Jennings' garden, for exhibition only, not for competition. A plant of *Anœctochilus Dawsonianus*, and of *A. Lowii*; a *Lycopodium* (new species) from Borneo, and *L. Hookerianum*.

In connection with the above, the Secretary read the following letter to his address from Mr. John Scott, and added that, with the 8 marks now awarded, there were 222 marks against Mr. Jennings' name, for rare plants exhibited since August 1867; and as an agregate of 200 marks is the number entitling an exhibitor to the Silver Medal, he was consequently entitled to such award —

"You have asked me to submit to the Society a note on the Orchid exhibited by Mr. Jennings at the late Meeting (November), and which, to myself and others, does not seem to have received the notice it merited. I thus take the opportunity to remark, that it is not only a new addition to our collection here, but that it is also one of the latest of its kind introduced to Britain, and is yet I believe only to be found in the nurseries of its introducers, Messrs Low and Sons, Clapham, London. From the remarks which I hear have been made upon it at the late Meeting, *viz.*, "That it was common near Simla," it seems to have been mistaken for the *Anœctochilus setaceus*, a species frequently met with in the sub-tropical and temperate parts of the Himalayas; from this it is, of course, abundantly distinct.

"The plant was exhibited by Mr. Jennings under the name of *Anœctochilus Ordii*, and so called in compliment to Lady Ord, by the gentleman who discovered it in the Island of Luzon, and to whom he was indebted for the specimens exhibited. This name, however, must needs be suppressed, as the species has been already noticed by Richenbach, *fil*, *vide*, Gardener's Chronicle for 1868, page 1038, under that of A. *Dawsonianus*, S. Low. It is a handsome and distinct species of robust habit, growing from five to six inches high. Leaves ovate-acute three and a-half-inches long by two inches broad, of a purplish-pinky color below, and a rich velvety green above, with a bold purplish yellow mid-rib, and eight well-defined lateral converging ribs of a similar color. Of the ribs, the central alone gives off the characteristic colored veins in a waving, simple and forked, and occasionally in a reticulate manner. These colored ribs and veins contrast prettily with the ground-work of glossy, dark, velvety green, and, with a naturally vigorous constitution, entitles the species to a first rank amongst the variegated foliaged Orchids now in our garden. It should, therefore, in my opinion, be awarded eight marks, *viz*, five as being new, and three for the healthy condition in which it was shown."

TEA DISEASE IN ASSAM, CACHAR, AND DARJEELING.

The Secretary stated it would probably be in the recollection of some of the Members present, that Dr. Thomas Anderson had kindly offered to send to the Rev. M. J. Berkeley certain specimens of Tea leaves from Assam affected by a kind of black smut, and of blighted Tea leaves from Cachar, both which were submitted at the Monthly Meeting of the Society in September last. Dr. Anderson had recently received a reply from Mr. Berkeley, of which he now submitted the following extracts :—

"I have spent a whole morning over your specimens, but unfortunately without much result, as I cannot find perfect fruit. I will, however, tell you what I observe in the specimens.

"1. From Cachar I do not find any fungus The spots are like those which occur in the genus Depazea, but there is not a trace of perithecia, and they may arise either from some constitutional condition or from some peculiarity of weather. In many of the spots, the whole of the parenchym has vanished, and there is scarcely anything left in the centre, except the discolored cuticle The spots in this case are quite transparent when held up to the light

"2. Black Smut. I have in vain hunted for perfect fruit. The fungus belongs, as far as external characters go, to Lévillés genus Asterina, but it is different from any species in my Herbarium. I should be glad to have specimens gathered early in the season, and then I may, perhaps, tell you whether it is undescribed, or whether it really belongs to Asterina

"3 One leaf has incipient Asterina without any perithecia, and the other has been sprinkled with the eggs of some mite, but I should think not the same with the red spider of our hot-houses.

"I made an infusion of the broken fragments of No. 1, which, both to the taste and smell, was extremely disagreeable.

"It would be well to get me fresh supply of diseased leaves from one or more estates, and I shall have great pleasure in examining them. It is very desirable to have further specimens of No. 1 The fungus in No. 2 is superficial, and belongs, as I believe, to a genus very widely spread, and requires damp for its development"

Dr. Anderson mentioned that, since he had sent the leaves from Cachar to Mr. Berkeley, he had himself observed the diseased form of leaves (generally called "blight" by the Cachar planters) on some Tea plants at Darjeeling. He carefully examined the diseased bushes, and could find no diseased leaves in any other stage of the disease, but that forwarded to Mr. Berkeley. He, however, found several leaves with a small insect lying under the epidermis of the leaf, and he supposed that this insect must have devoured the parenchyma, and caused the transparent spots (blight) with which the leaf was covered. Dr. Anderson exhibited some of these leaves with the insect in position; also a few leaves with minute eggs of an insect, collected in patches on the surface of the leaf. Dr. Anderson said that he found many of the indigenous plants in the forest, adjoining those Tea estates in which blight had been observed, were also affected. He particularly noticed *Gordonia Wallichii*, a Ternstrœmiaceous plant nearly allied to Tea, a *Polygonum*, an *Osbeckia* and *Mæsa montana*, as suffering much from the blight. Dr Anderson shewed young leaves of *Chinchona succirubra* from a Tea estate at Darjeeling; these leaves were covered with blight spots [*]

Dr Anderson read a note on the trial sowings at Darjeeling of the seeds of *Chenopodium Quinoa* which he received last year from the Society. He also submitted copy of a letter which he had addressed to the Government of Bengal, respecting the cultivation of the Ipecacuanha plant in India, and the manner in which it could be attempted. (Transferred for publication in the Journal)

For the foregoing communications and presentations, the best thanks of the Society were accorded.

Friday, the 19th February 1869.

J. H. Crawford, Esq , *President, in the Chair*

The Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members —

Dr. C. T. Paske, Capt. E. Ward, Cowr Suttyanund Ghosal, and C. Graf, Esq.

The names of the following gentlemen were submitted as candidates for election :—

Jaffray O'Brien Sccales, Esq., Catchecutta Factory, Chooadanga,—proposed by Lieut -Col J R. Abbott, seconded by the Secretary.

Arthur L. Sykes, Esq , Merchant, Calcutta,—proposed by Mr. S. J. Leslie, seconded by Mr. G. O. Beeby.

Charles Graham, Esq , Castleton, Kurseong,—proposed by Mr. J. G. Meugens seconded by the Secretary.

The following contributions were announced :—

1.—Selections from the *Calcutta Gazettes*, Vols. 1 to 4,—from the Record Commission.

2.—Annual Report of the Agricultural and Horticultural Society of British Burmah, for 1868,—from the Society.

3.—Journal of the Asiatic Society of Bengal, Part 2, No. 1, 1869,—from the Society.

4.—Letter from General Cotton to Under-Secretary of State for India, in respect to certain Agricultural Implements sent to Madras,—from the Government of Bengal

5.—Cinchona Report (Darjeeling), October 1868,—from Dr. T. Anderson.

6 —A pamphlet on the culture of Sumach near Palermo, and a biographical notice of the late Dr. Walker Arnott,—from Dr. Hugh Cleghorn.

7.—Tobacco culture, Prize Essays, America,—from Col. J. C. Haughton

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[*] Since the Meeting was held, Dr. Anderson has examined the insect with the microscope, and finds that it is the [illegible] of an insect, probably a beetle, and that it lies under the epidermis. Probably the destruction of the parenchyma is caused by the larva, and thus the almost miscroscopic eggs on the other leaves may belong to the same species

8 —Records of the Geological Survey of India, Vol. 2, Part 1, and Memoirs of the same, Vol. 6, Part 3,—from the Curator.

9.—A small assortmennt of seeds from New Zealand,—from Mr. John Thomson.

10 —A small quantity of Melon seeds, "Surda" and "Gurma,"—from the Agricultural and Horticultural Society of Lahore.

The Secretary announced that these had been already distributed to Members in Rangoon, Assam, Lower Bengal, and some parts of Upper India, and a further portion was in course of distribution, with the view of giving them a fair trial, and obtaining seed in return from this fine stock.

11.—A small collection of Himalayan seeds,—from Mr. G. P. Paul.

12.—Two specimens of Gum from *Acacia catechu* and *Conocarpus latifolius*, and flowers of *Grislea tomentosa* and *Butea frondosa*; &c.,—from Mr. C. J. Dumaine.

Mr. J. H. Linton exhibited two monster Radishes, the long red, and white turnip, raised in his garden in ordinary soil, the former measuring 21 inches in length and 18 inches in circumference, and the latter 17 inches in circumference.

The President announced that, as instructed at the last Meeting, he had communicated with the Private Secretary to his Excellency the Viceroy, and that Major Burne had intimated that their Excellencies the Viceroy and the Countess of Mayo had much pleasure in acceding to the request of the Society to become Patrons.

The Secretary intimated in reference to the Resolution passed at the last Meeting, that the Annual Show could not, unfortunately, be held on the 12th instant as proposed. The Calcutta Cricket Club had obligingly granted the use of their ground, and Colonel Henning had kindly consented to give the services of the Band of the 26th Cameronians, but the Ordnance Department were unable to place, as in previous years, the use of the necessary number of tents at the disposal of the Society, in consequence of their being required for public service.

The motion of which notice was given by Baboo Peary Chand Mittra at the last Meeting, that an additional Section be added to Chapter V. of the Bye-laws, embodying certain recommendations of the Council, with the view of equalising the privileges of newly elected Members, &c., was next submitted and passed unanimously.

Baboo Peary Chand Mittra proposed, Mr. John Lynam seconded, and it was agreed, "that a Special Committee of the following gentlemen be appointed for the purpose of considering and reporting in what respect the present arrangements for Vegetable and Flower Shows should be modified, as regards the vegetables and flowers which should receive special encouragement, and others which may be omitted on the schedule, namely, the President, Mr. W. Stalkartt, Dr. Tonnerre, and the Mover."

REPORT OF SUB-COMMITTEE ON SOCIETY'S GARDEN.

Read the following Second Report (the first submitted at Meeting in December last) of Sub-Committee on transfer of the Society's Garden.—

Your Committee met again on Monday, the 8th February, and having previously communicated with Dr. Anderson, and obtained his consent to all the proposals generally, agreed as follows —

1stly.—Mr Errington to make out a list of all the moveable property belonging to the Society in his possession—such as furniture, tools, implements, bell-glasses, boxes, pots, fruit grafts, &c,—for which the Botanical Gardens will pay such price as may be determined on by the Committee on the report of Messrs. Scott and Errington

2ndly.—Mr. Errington to make out a general list of the ornamental plants in pots in stock, as also a detailed list of all the larger and finer plants in the ground for transfer to the Royal Botanical Gardens, under arrangement for a similar collection to be given to the Society whenever required for stocking a new garden.

3rdly.—The remaining portion of the ground and the house to be made over on the receipt of the Superintendent, Royal Botanical Gardens, on the 1st March next, and on which receipt the remuneration of Rs. 12,000 to be claimed from Government.

4thly—Pending these arrangements the distribution of plants to Members to cease from and after the 8th February next, and to be resumed by the Royal Botanical Gardens from the 15th June next, as usual—Delivery orders may, however, be given for Orchids, or for such other plants as can be sent out during the dry season, if absolutely necessary

5thly.—Draft of delivery order submitted for adoption.

The Section marked—

1 To be retained in the Office of the Society;

2. To be sent to Members;

3. To be sent to the Curator, Royal Botanical Gardens, previously to the presentation of No 2 to him by the Members.

6thly.—Referring to the proposal for the sale of seeds of trees, shrubs, creepers, &c., from the Royal Botanical Gardens, the Committee propose that such be undertaken, provided they be sent the Society in ready-made classified packages, and need, and that the commission be Rs 10 per cent. on sales, which are to be effected for cash only.

S. H. ROBINSON.
SAMUEL JENNINGS.
A. H. BLECHYNDEN.

The Report was confirmed.

PROVISION OF SEEDS FOR 1869.

Read the following Report from the Special Committee, appointed at the last Meeting, in respect to the provision of seeds for the current year:—

Your Committee have taken into consideration the subject referred to them at the last General Meeting, *viz.*, to arrange for the provision of seeds for the current season, and now beg to report as follows:—

Vegetable Seeds.—Those from America having, with few exceptions, germinated readily, the order for them has already been given, with suggestions to pack the Peas and Beans in separate packets, and not to be shipped in bulk as heretofore.

The reports in respect to the sowings of the seeds from London and Paris, being of a conflicting nature, your Committee recommend, with slight modifications in the list,—*viz.*, a less quantity of the *Brassica* tribe, an increased quantity of some other kinds, and the omission of 2 or 3 sorts, which are not generally cultivated in Indian gardens,—that the order be equally divided between Messrs. Jas. Carter & Co., and Vilmorin, Andrieux & Co, as your Committee are not prepared to impute blame generally to them.

It is recommended to obtain from the Upper Provinces a supply of acclimatized cauliflower seed to add to the collections of the Vegetable seeds.

Flower Seeds—Your Committee recommend that a proposal from Mr. Scott, the Curator of the Royal Botanical Gardens, to supply the Society with 700 packets, of 28 sorts, of acclimatized seeds of Annuals (as per memo accompanying, and showing the mode in which it is proposed the arrangements shall be carried out) be adopted experimentally,, and, that 40 other kinds of really good old and new sorts, some of which are recommended by Mr. Scott,—who remarks that he speaks from experience of several of the species, and that he has been guided in the selection of the others by their natural habitats and notes on their treatment in European gardens.—be equally divided and imported from Messrs Jas. Carter & Co and Vilmorin, Andrieux & Co

It is further suggested that a quantity of acclimatized mignonette seed be obtained from the Punjab as an acceptable addition to the assortment of flower-seeds.

Field Seeds from Messrs. Law, Somner & Co—Referring to the excellent condition in which these were received in November last from Melbourne, including certain kinds of garden seeds, but too late in the season to be generally availed of, your Committee recommend that the residue of these seeds be carefully packed in tin and distributed to Members for experimental sowings this year, with the view to test the advisability of importing such seeds from that locality in the dry season of the one year for sowing the next.

In conclusion, your Committee are of opinion that the additional precautions which are contemplated to secure the seeds this year from the least exposure to the injurious influence of the damp season at which they usually arrive here, if carefully carried out, will tend to a more favorable result in sowings for the next season than has hitherto been the case.

METCALFE HALL, }
February 5th, 1869. }

SAMUEL JENNINGS
LIONEL BERKELEY

The Report was confirmed. It was further agreed that an additional quantity of a few favorite kinds of Annuals such as Portulacca, Phlox, Larkspur, Nasturtium and Balsam, be ordered in bulk, for distribution to Members at price cost.

In connection with the above, the Secretary submitted a Report from the Head Gardener on his trial sowings of the Vegetable seeds received from Messrs. Law, Somner and Co., showing a general average result of 54 per cent.

NORTON'S TUBE WELLS.

Referring to the Resolution passed at the December Meeting, the Secretary intimated that two Meetings had been held, by public advertisements, of those interested in the subject of Norton's Tube Wells, in the grounds of Castle Rainey, Ballygunge, during the past month. He now begged to read certains notes of the experiments, with which he had been kindly furnished by Mr. Cowper, Engineer, P. and O. Co.'s establishment, who had obligingly undertaken the superintendence of them —

"Sank three wells in Mr. Griffith's compound at Ballygunge. One in the centre of the compound; found water at 9 feet, the other two, on the left side of entrance, in which I found only sharp sand, from ten to thirty feet.

"I removed a well to a small field facing the house, in the centre of which I found no water, to the right side about thirty feet, I found water at 16 feet.

"I sunk a well to the left-hand side of the lower gate, close to a tank, I found water at 8 feet, which was above the level of the tank, (the water of which was very clear).

"I sunk a well on the right side of the house, close to a well, and could not get any water at 24 feet, which was ten feet below the level of the well, then I sunk another well on the right side to the main entrance, and found water at 10 feet. Being requested to sink the well deeper, I lost water at 11 feet, though I had sunk it down to 24,—all to no purpose.

"Sunk a well in P. and O. Co.'s compound (No 7), back of Boiler shop, found water at 10 feet. Sunk another one in the Timber yard, and got no water at 30 feet; sunk another one opposite Work-shop, and met with the same result.

"Sunk a well in Mr. Baines' compound in front of the godown, got no water at 20 feet; then I sunk a well at back of the house, and got a little water at 10 feet. Sunk another well 20 feet to the right, and met with same result.

"Sunk a well at foot of the compound, got plenty of water from 10 to 16 feet.

"Sunk two wells in Captain Paterson's compound, back of Ice-house, and got only sharp sand."

Read also the following note from Mr. Thomas Munro, who has taken much interest in the subject:—

"I have not had a spare minute to write an account of the Hooghly trial of Norton's Tube Well; indeed, there is little to state, the sand having quickly blocked the lower end of the Tube.

"In all the trials I conducted, the Tube was sunk to beyond twenty feet, and I believe it is useless trying them again until the Sand Tubes arrive.

"The Ballygunge trials have certainly been the most successful, possibly on account of the distance from the river.

"I may manage to have another trial this day week, when I will select a spot some miles from the river, likely near the Hooghly Railway station."

In connection with this subject, the Secretary read the following letter from Captain G. Gordon Young, Settlement Officer, Seetapore, to the address of the President —

"I have just read a para. in the published Report of the Meeting of the Agricultural and Horticultural Society, held on the 20th ultimo, with reference to 3 sets of Norton's Tube Wells which have been undergoing trial in Calcutta.

"I have no claims on your kind offices, not being a Member of your Society, but venture to trouble you with this letter nevertheless, in the interest of Irrigation and of Agriculture generally.

"This District, of which I am the Settlement Officer, is very badly off for wells, and, though Government has lately made the most liberal offers of *Tuccavee* advances to promote the construction of masonry wells, the people are backward in availing themselves of these offers; and I believe one of the main reasons to be that, as hitherto they have not been in general use, the necessary amount of skilled labor for building them does not exist in outlying villages,—a sub-stratum of land is reached, and the cylinder sinks down so rapidly—and sometimes unevenly,—that, of the few that have been made, a large proportion have split, and the money expended has been lost.

"Now I believe this to be the very sort of place on which these Tube Wells should answer, if they are to answer at all in this country, and I beg, therefore, that you will oblige me with a brief note, stating whether in your opinion, it would be worth while procuring some for distribution, or not, and, generally, the result of the late experiments made under your orders.

"I should add that I do not propose to try them except in localities where water is to be found within 20 feet of the surface.

"If the Society could be induced to spare one of the Wells for trial in this part of India, I should be very glad to know as much with the view of purchasing one, if there is a reasonable hope of their succeeding."

MISCELLANEOUS COMMUNICATIONS.

The following letters were also submitted.—

1.—From S. E. Peal, Esq., of Seebsaugor, Upper Assam, forwarding specimens of caterpillars, crickets, &c., destructive to tea plants.

2.—From T. E. Carter, Esq., the following extract of a letter from a correspondent at Tezpore, Upper Assam:—

"I send you per dâk banghy a most curious bunch of grubs in their houses. I cut it from a tea bush which was literally covered with them, all the leaves, buds, and some of the bark having been devoured by them; and you will observe their very habitations are built of twigs from the tree. I observed some half-dozen trees round attacked in this manner, but not to such an extent. The sirdar also had come across some in another part of the garden."

Agreed that these insects be referred to Dr. Stolickza, with a request that he will have the kindness to examine and report on them.

3.—From Messrs. James Veitch and Sons, London, forwarding overland a box of rose plants and some bulbs of Achimines, Caladiums, &c.

The Secretary mentioned that Mr. Berkeley, who had kindly consented to attend to these plants, reports that only 23 of the roses show signs of life, and he fears that not more than a dozen will survive.

4.—From Assistant Secretary, Government of Bengal, submitting extract of a letter from the Ceylon Government, intimating that the Director of the Royal Botanic Gardens at Peradenya reports that the Assam tea seed sent by the Society had reached him in excellent order, and that some had already commenced to germinate. This seed was sent in compliance with a requisition received from the Bengal Government in September last.

5. —From Dr. James Irving, Allahabad, suggesting that a trial be made for preserving the germinating power of imported seeds by placing them in ice. The following is extract of Dr. Irving's letter:—

" I have a suggestion to make in reference to these seeds which, I should be glad if you laid it before the Society. It is that the seeds after arrival should be kept in ice. I got the idea from attending Sir J. Simpson's Lectures on Midwifery in Edinburgh some five years ago. He mentioned that he had observed that the ova of an insect which was deposited on the window-sill of a cold room, in which a fire was seldom or never lit in the winter, took longer to germinate than the same kind of ova lying on the sill of a room freely exposed to sun, and in which a fire was lit. The idea struck me that as cold did not prevent but merely retard germination of the ova, it might be used to preserve the germinating principles of vegetable and flower seeds in India. Two or three years ago I did up some seeds in a tin box, which was soldered so that no water could gain access, and kept them all the hot season and rains in my ice box. In October, they were sown and germinated freely. Might this plan not be tried on a larger scale by the Society? A small box of seeds might be done up in tin and kept inside the ice-house ice-pit, or suspended from a beam in the ice-house, and those seeds might be compared with others not so treated. The proprietors of the ice-house I dare say, would not object to this experiment being made."

Agreed to have 2 packets of seeds placed in the ice-house on arrival from London and Paris.

6.—From Mr. Gammie, Head Gardener, in charge of Cinchona cultivation, Darjeeling, to Dr Thomas Anderson, Superintendant, Royal Botanic Gardens, reporting on *Chenopodium Quinoa :—*

" I have the honor to inform you that the seeds of *Chenopodium Quinoa* referred to in your letter No. 64 of the 21st instant, were sown near the Runghee houses and at Rishap in December last, but not a single seed germinated. Mr. Jaffray had, however, saved a small quantity from last sowing, from which there are a few hundred plants. They have been planted in one of the old officinalis nursery beds at No 4 Plantation, and will receive every attention."

7.—From C. Brownlow, Esq., forwarding an interesting account of a journey recently made up the Valley of the Jatinga, Cachar. (Transferred for publication in Journal).

For the above contributions and communications the best thanks of the Society were accorded.

EXHIBITION OF PLANTS.

The following plants were submitted:—

From Mrs. Alexander Ross, Fort William, seven exceedingly well-grown Geraniums, including a fine plant of the Ivy; two plants of double stock in full flower; Verbenas (5), Columbine (1), and a Saxifrage.

From Mr. A Rogers,—two Hyacinths, white and pink, in full flower.

From Mr. A. H. Mowbray,—a *Vanda gigantea*, and *Cœlogyne (nitida ?)*.

From Mr. John Lynam,—an exceedingly fine plant of *Phalænopsis amabilis*, and one of *Cypripedium venustum*.

From Mr. W. Ter Veen,—19 Ferns, 8 *Begonias*, 8 sorts; 10 of double and single Pink, 1 of double Stock and 2 of Phlox.

From Rajah Suttchurn Ghosal,—one plant of *Renanthera coccinea*, a very fine example in bud, two fine plants of *Olea fragans*, one of *Camelia*, 5 Ferns of sorts, 2 *Begonias*, 2 *Franciscœas*, one fine plant of *Cissus discolor*, and a few other plants.

Dr. Tonnerre and Mr. Jennings, as judges, awarded as follows.—

To Mrs. Ross, for Ivy Geranium, 5 marks; for double stock, 2 marks.

To Mr A. Rogers, for Hyacinths, 5 marks each; these are the finest flowers of Hyacinths that have been brought to the notice of the Society.

To Mr. Mowbray, for *Cœlogyne nitida*, 2 marks.

To Mr. John Lynam, for *Phalænopsis amabilis*, 5 marks.

To Mr. Ter Veen, for double stock, 2 marks.

Wednesday, the 17th March, 1869.

J. A. CRAWFORD, ESQ., *President, in the Chair*.

THE Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members.—

Messrs. J. O'Brien Sceales, A. L. Sykes, and C. Graham. The names of the following gentlemen were submitted as candidates for election:—

The Rev. Julian Robinson, Allahabad,—proposed by Mr. E C. Bayley, seconded by Mr. J. A. Crawford.

J. W. Sherer, Esq., C.S. & C.S.I., Allahabad,—proposed by Mr. Samuel Jennings, seconded by Mr. Lionel Berkeley.

George Woodbridge, Esq, C.E., Oude and Rohilcund Railway, Bareilly,—proposed by Mr. Jennings, seconded by Mr Berkeley.

M. Lovell, Esq., Deputy Chief Engineer, Bareilly,—proposed by Mr. Jennings seconded by Mr Berkeley.

Manager of Nutwanpore Tea Garden, Cachar,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

The Deputy Commissioner of Oomrawuttee,—proposed by Major W. Nembhard, seconded by the Secretary

The Deputy Commissioner of Ellichpore,—proposed by Major Nembhard, seconded by the Secretary

The Deputy Commissioner of Woon,—proposed by Major Nembhard, seconded by the Secretary.

The Honorable Justice C. Turner, Allahabad,—proposed by Mr. S Jennings, seconded by the Honorable Justice J. P. Norman.

Major J. W. Rind, Mussoorie,—proposed by Mr L Berkeley, seconded by Mr. A. H. Mowbray.

Read the following letter from the Private Secretary to His Excellency the Viceroy.—

"*Government House, Calcutta, 11th March*, 1869.

"DEAR SIR,

"His Excellency the Viceroy desires me to say that it affords him great pleasure to give a donation of Rs. 500 to the Agricultural and Horticultural Society.

(Sd.) O. T. BURNE."

The Secretary intimated that, pursuant to the instructions contained in the Report of the Sub-Committee on the Society's garden, which was submitted at the last Meeting, the remaining portion of the ground, and the house standing thereon, had been duly made over to the Curator of the Royal Botanic Garden on the 27th February, and he had obtained from the Government of Bengal an order for the payment of the remuneration (Rs. 12,000) accorded by the Government of India; that nearly all the stock in the shape of tools, bell-glasses, pots, &c. &c., with the exception of three or four articles, had been taken over by the Royal Botanic Garden at a cost of about Rs. 1,300: and further, that the Curator had granted a receipt for all the ornamental plants in the ground and in pots transferred to the Botanic Garden, under arrangement for a similar collection to be given to the Society whenever required for stocking a new Garden.

Resolved, that the above be put on record for future reference.

The President submitted a letter to the address of the Secretary from Mr. Grote, dated 21st January, acknowledging the receipt of the remittance of £50, as resolved at the December Meeting, towards a portrait of himself, as agreed on at the General Meeting in August last. He also submitted a letter from Mr. Grote to his address of the 17th January on the same subject, and read the following recommendation of the Council thereon.—

"That with reference to the letter, dated 17th January, from Mr. Grote to the President, a further sum of Rs. 550 be remitted to Mr. Grote, and that this sum be borrowed from the vested fund of the Society, to be repaid from the savings of the Society's monthly expenditure."—Agreed to.

AGRICULTURAL CAPABILITIES OF THE HUZARA COUNTRY.

The Secretary next submitted copy of a letter addressed by Mr G. F. Landells dated Calcutta, 11th January, to Major Pollock, the Commissioner of Peshawur, regarding the Hazara country.

The Secretary mentioned he had requested Mr. Landells to send flowers of the poisonous shrub referred to in his letter, as it could not be recognized merely by leaves.

LETTERS WERE READ:—

1.—From Messrs James Veitch and Son, London, forwarding a box of Rose plants and an assortment of bulbs of Caladiums, Gloxinias, Achimines, Tydœas Lilies, &c., and requesting an interchange in the shape of Orchids.

The Secretary stated that on opening the box the bulbs were found, with few exceptions, to have perished. Of the 44 kinds of Roses, 23 shewed signs of life, but Mr. Berkeley, who had kindly taken charge of them, feared that scarcely more than a dozen would eventually survive; he would give a fuller report hereafter

2.—From Dr. Forbes Watson, London, advising despatch of 9 different kinds of *Quinoa* seed from Arequipa in continuation of the supply forwarded last year.

The following extract from letter addressed to Messrs. Anthony Gibbs and Sons accompanied the samples from Arequipa:—

"We understand that all the kinds contained in the small bags are commonly used in the Sierra as an article of food, but the *Amarga* as a medicine only,—both internally as an emetic and as a substitute for Quinine in the case of ague, and externally as a poultice for cancer, gangrene, contusions, &c., its chief property for the latter purpose being its great astringency.

"We are informed that though the Quinoa plant flourishes at altitudes where no ordinary cereal can be cultivated, and even higher up than the potato, it is in some respects rather delicate, requiring a good deal of moisture, but unable to withstand any great degree of frost. In the Sierra it is sown about the beginning of the rainy season, in September or October, and harvested from January to March according to season and locality. By another informant we are told that March is full early for the harvest, and that April is more the average month."

Portions of this seed are available to any residents on hill stations who may wish to give them a trial.

3.—From F. R. Browning, Esq., Seetkotta, forwarding, as requested, sample of the soil on which the fine cotton, reported on at the January Meeting, was raised. (This sample has been transferred to Mr. Waldie, for analysis.)

4.—From H. G. French, Esq., referring to an Australian Shrub which is reported to be superior even to the Mulberry as a silk-worm feeder :—

"In the *Illustrated Sydney News* of the 28th November 1868,"—writes Mr. French,—is the following :—

"'A native shrub has just been discovered both on Phillip Island and the shores of the western port bay, which is far better than Mulberry for feeding silkworms. Silkworms raised upon it produce far more silk than those bred in any other manner.'

"It would benefit this country greatly to learn the name of the shrub, as it may be procurable on our seacoasts, and also to obtain a box or two of the plants.

"You might place this proposal before your Committee, and through some Members of the Society, who have friends or relatives in either of the places mentioned, the object might be gained without any great expenditure."

Agreed that enquiry be made regarding this tree.

5.—From Dr. E. B. Browne, Secretary, Agricultural and Horticultural Society, Lahore, promising to send as requested, a quantity of acclimatized Cauliflower and Mignonette seed. "We would prefer," adds Dr. Browne, "not to receive money for it as you have so greatly assisted this Society during the past year, and we hope for further assistance on the present and future years, particularly in supplying us with seeds of Calcutta fruits, such as Lychees, Jack, Cocoanuts, &c., of which there are only very few specimens in the Punjab."

6.—From Colonel E. Boddam, Secretary, Agricultural and Horticultural Society, Bangalore, applying for some acclimatized Cauliflower seed, as that raised from European seed has not been found to succeed.—To be complied with.

7.—From J. C. Holding, Esq., Secretary, Cape of Good Hope Agricultural Society, of which the following are extracts :—

"I unfortunately missed, through being absent in the country, and the uncertainty of direct communication with Bengal, a former opportunity of acknowledging the receipt of your letter of 10th August, Melon seeds, and Vol. 1 (Part II, new series) of the Society's Journal of 1868, which Captain Sandberg of the *South Eastern*, safely delivered ; and for which I am directed to return you the best thanks of our Society. The failure in the seed Oats, which you kindly procured for us, may, I think, be attributed to the heat of an iron ship whilst passing though the Tropics, and which is considerably above that of a wooden one. It is difficult, I know, to guard against these contingencies ; and the small quantity that we have been able to save must atone for the other losses.

"Our Silk growers are anxious to try some eggs of the Indian Silkworm and compare results with those imported from Japan and France. Any eggs, therefore, or directions respecting the treatment of the worms, will be most acceptable and highly appreciated.

"Both the Bombyx Cynthia and the Yama Mai have been introduced into the Colony from Europe—the former with promising success : and as the Mulberry, Ailanthus, and Oak grow readily in almost every section of the Colony, there is every encouragement to prosecute extensively these new branches of industry.

"Could you further aid our efforts by procuring our Society some genuine seed of the "Convolvulus Scammonia" and "Exogonium Purga"? We are anxious to introduce cultivation of these and other new products by way of experiment, as we believe a great deal may be done to improve the resources of S. Africa.

"I trust you will excuse my asking these favours in consideration of the importance of the subject. I may add that, partly through the kindness of your Society in furnishing us with superior varieties of seed, the Cape is now producing a considerable quantity of Tobacco; and we are inclined to believe that if more attention is paid to the manipulation of the leaf, a very superior article will eventually be brought into the market. Has the Prairie Grass ("Bromus Schroderi") ever been tried in India? We introduced it into the Colony about four years ago, and from our experience since that time we can confidently recommend it as a most nutritious and valuable grass for fodder. It grows in almost every description of soil, and will withstand very severe droughts. Should you like to try some seed of this or any other acclimatized product, our Committee will feel much pleasure in forwarding whatever may be susceptible of profitable cultivation, and contribute to the comfort and sustenance of the population of India. The advantages resulting from the introduction of a new commodity of utility for consumption or commerce can scarcely be over-estimated, and there are numerous useful products in distant parts that never have found their way into this country, and which we are persuaded, might be cultivated with a fair chance of success. And as one object sought to be attained by this Society is the introduction and dissemination of new seeds, we shall feel much obliged by your continued kind co-operation in whatever way you may find it most convenient."

Exhibition of Plants.

The following plants were exhibited.—

By Mr. John Lynam.—*Cypripedium hirsutatissimum*, *Dendrobium Devonianum*, *D. Farmeri*, *D. onosnum*, *D. macrophyllum giganteum*, *D. infundibulum*, and *Phalænopsis Schilleriana*.

By Mr. A. H Mowbray.—*Phalænopsis Shilleriana*, *Dendrobium albo-sanguineum*, *D. Griffitheanum (?)* and a cut flower of a Manilla Dendrobe.

By Dalhousie Square Gardener.—*Phalænopsis amabilis (3 plants)*, *Dendrobium Pierardii*, *Oncidium luridum*, *Vanda teres*, *Epidendrum crassifolium*, Begonias, Amaryllis, and a few annuals, such as asters, heartsease, and double stock.

By Rajah Sutt Shurn Ghosal.—*Renanthera coccinea*; *Cissus discolor*; *Gesnera*; Begonias, 4 kinds; Lilies (2) *Franciscea latifolia*, a *Coleus*, a geranium, *Rhyncospermum jasminoides*, and a few annuals.

By Mr. W. TerVeen.—3 pots of Victoria Aster, and a fine specimen of *Gladiolus*

By Mr. W. Pigott.—7 pots of seedling Verbenas all of fine varieties, 2 or 3 quite new.

The following were sent in for examination, not for marks —

By Mr. Lawrie.—*Phalænopsis amabilis* (3 plants), 6 kinds of Dendrobes, *viz.*, *D. calceolus*, *D. Devonianum*, *D. macrophyllum giganteum*, *D. infundibulum*, *D. Pierardii*, *D. secundum*, and *Oncidium ampliatum*.

The above plants were all in excellent condition.

By Mr. John Scott, Curator, Royal Botanic Gardens.—*Dalechampia Rœzliana rosea*, *Peperomia œrifolia*, *Gymnostachyum Zeylanicum*, *Saccolabium dentriculatum*, *Dendrobium secundum*, *D. nobile*, *D crepidatum*, *D. Farmeri*, *Cælogyne flaccida*, *Vanda cristata*, *Cymbidium lanceæfolium* and *Anæctochilus species* from Borneo, received from Mr. Samuel Jennings. In respect to this *Anæctochilus*, Mr. Jennings writes,—"It is a native of one of the Singapore Islands, very rare indeed, discovered by the Honorable Dr. Little, who forwarded it to me. Being unnamed I wish it to be called *Anæctochilus Ordiæ*, or Lady Ord's *Anæctochilus*. It is very like *A. Dawsonianus*, but the colour is a rich deep green."

Dr. Tonnerre and Mr. W Stalkartt, as judges, awarded as follows:—

To Mr. John Lynam, for his fine plant of *Cypripedium hirsutatissimum*, flowered for the first time in Calcutta, 6 marks; *Phælonopsis Schilleriana* not flowered before this year in Calcutta, 5 marks; *Dendrobium onosmum*, not flowered before, quite new, 6 marks; D. *macrophyllum giganteum*, a fine example, 4 marks; and *D. infundibulum* 3 marks.

To Mr. Mowbray.—*Phalænopsis Schilleriana*, 5 marks; *Dendrobium albo sanguineum*, 3 marks.

To Dalhousie Square Gardener.—*Phalænopsis amabilis*, 3 plants, 2 marks each.

To Rajah Sutt Shurn Ghosal.—*Rhyncospermum jasminoides*, a well grown plant, in full flower, 2 marks.

To Mr. TerVeen.—For Asters, a very fine variety, in beautiful flower, 3 pots;—3 marks.

Wednesday, the 21st April 1869.

Baboo Peary Chand Mittra, V. P., *in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentleman were elected Members:—

The Rev. Julian Robinson; Messrs. J. W. Sherer, c.s., George Woodbridge, c.e., M. Lovell; the Manager of the Nutwanpore Tea Garden, Cachar; the Deputy Commissioner of Oomrawuttee; the Deputy Commissioner of Ellichpore; the Deputy Commissioner of Woon; the Hon'ble Justice C. Turner, and Major J. W. Rind.

The names of the following Gentlemen were submitted as candidates for election:—

W. C. Plowden, Esq., c.s., Allahabad,—proposed by Mr. Samuel Jennings, seconded by Mr. Lionel Berkeley.

R. M. Daly, Esq., H. M. Bengal Marine,—proposed by Mr. H. Knowles, seconded by the Secretary.

The President of the Allahabad Municipality,—proposed by Mr. Samuel Jennings, seconded by the Secretary.

James Robinson, Esq., C.E., Officiating Executive Engineer. Shillong Division,—proposed by Captain R. M. Skinner, seconded by Mr. S. H. Robinson.

The Proprietors of the Jugdispore estate, Behoea,—proposed by Mr. Walter Thomson, seconded by the Secretary.

Baboo Mohesh Chunder Banerjee, Cuttack,—proposed by Mr. Joseph Armstrong, seconded by Baboo P. C. Mittra.

Captain J. H. T. Farquhar, Poosah Stud,—proposed by Dr. C. Fabre Tonnerre, seconded by the Secretary.

The following contributions were announced:—

1.—Annual Report for 1866, and Monthly Reports for 1866 and 1867, of the Department of Agriculture, United States of America,—from the Department.

2.—Annual Report of the Board of Regents of the Smithsonian Institution for 1866. Patent Office Report for 1863, vols. 1 and 2; for 1864, vols. 1 and 2; and for 1865, vols. 1, 2 and 3,—from the Smithsonian Institution.

3.—Memoirs, of the Boston Society of Natural History, vol. 1, Part 3; and its Reports for 1867 and 1868, from the Society.

4.—Reports for 1867-68 on the Administration of the Punjab; of the North-West Provinces; of British Burmah; Mysore; Coorg; Hydrabad Assigned Districts and the Madras Presidency,—from the Government of Bengal.

5.—A small supply of several sorts of Sugar-cane from the Burdwan District, intended for the Mauritius Botanic Garden,—from Baboo Mohendro Chunder Mookerjee.

The Secretary stated that, in consequence of some unexplained delay in the despatch of these canes by rail, they had not reached in good order. Instead, therefore, of forwarding them to Mauritius, he had transferred them to the care of Mr. Scott, Curator of the Royal Botanic Garden, who had kindly promised to attend to them with a view of raising stock therefrom for the Mauritius Botanic Garden next year.

6.—A quantity of freshly-gathered Teak seed,—from J. A. Crawford, Esq. (Available for general distribution.)

7.—A good supply of acclimatized Cauliflower seed,—from the Agricultural and Horticultural Society of the Punjab.

8.—A supply of the same from Gazeepore,—presented by J. A. Sturmer, Esq.

9.—Several packets of Tinnevelly Senna seed,—from Dr. E. Balfour, Deputy Inspector General of Hospitals, Madras Presidency. (Available for general distribution.)

10.—A maund of acclimatized Carolina Paddy,—from Colonel E. H. C. Wintle.

PARTICULARS REGARDING A CONTAGIOUS DISEASE TERMED "PACHIMA" NOW RAGING AMONG CATTLE IN THE SOONDURBUNS AND ITS VICINITY.

Read the following letter, dated 18th April, from Mr. H. James Rainey on the above subject.—

"In the hope of obtaining from some one of the Members of your Society a remedy for a disease now epidemic among the cattle in certain parts, if not the whole tract of the Soondurbuns and the country immediately bordering thereon; I venture to address you on the subject.

"The malady is designated by the natives *Pachima*, and is at present fast destroying the cattle, the mainstay of the poor *ryots*, who appear to be utterly powerless to check it in any wise, as the disease has assumed quite an epidemic form, and its victims, it is said, invariably fall off and die within the course of two or three days from its attack. I shall briefly give the symptoms, as well as the treatment usually restorted to, and which has proved quite a failure.

"*Symptoms.*—Commences with hot and feverish skin, quickly followed by a swelling of the throat; the tongue also increases in size considerably, and protrudes out. The animal loathes its food from the beginning, and afterwards appears to be prevented from swallowing it by some impediment in the passage of the gullet. Death generally terminates the poor beast's sufferings in a couple of days, or at most three.

"*Treatment.*—The so-called remedies generally had recourse to, are merely strong and heating irritants, such as hot spices and chillies.

"There is no doubt, I think, that the disease is infectious, and therefore, those taken ill with it should be kept strictly separated from the others, and not allowed to feed in the same meadow or drink out of the same pond. This is what I have recommended, as I found no such precautions had been adopted, and that the tainted and untainted ones were permitted to herd together indiscriminately. Perhaps, together with other remedies, a strong purgative at the out-set, and subsequently blood-letting might prove advantageous, but as the natives of this part have no idea of phlebotomy as applied to animals, leeches might be substituted with advantage to reduce the enormous inflammation: of course fomentation would be a milder treatment, and might prove more efficacious.

"While on the subject of cattle diseases, I may remark a total absence, as far as I am aware, of any simple Manual or treatise on Bengali on such subjects, this is a very great *desideratum*, and which Government would do well to endeavour to supply. The utility of such a work, if issued in a popular form, would no doubt be immense, and perhaps your Society might be induced to make a representation on the subject to his Honor the Lieutenant-Governor, who would no doubt accede to such a recommendation emanating from such a source. This matter is deserving of every consideration, and I trust this suggestion may be communicated to the Members of the Society with the view of their taking action in the matter, and, as many of them are landholders, I need not dilate to *them* the benefit which would accrue to their generally helpless tenantry from an undertaking of this nature."

In reference to the above, the Secretary called attention to Dr. C. Palmer's report to Government on the Calcutta Epizootic or cattle disease of 1864, in which occurs the following passage from a communication from Mr. Oliphant, writing from Jessore:—"There is, however, another disease in this part of the country very similar to the above, but much more common called "Puschima," probably because it was supposed to have travelled from the West, and large numbers of cattle have fallen victims to this disease within the last few years. The symptoms are, for the most part, the same as in the first-mentioned disease, [Mardrishtee, or Eczema Epizootica] with the exception that no pustules are visible on the body. The natives, however, appear to think that the two diseases are distinct, and that what Cholera is to man "Puschima" is to cattle, they look upon it as fatal and do not appear to try any remedy or cure. Mr. Oliphant states that owing as he is informed, to the ravages of this latter Epizootic chiefly, the diminution of cattle in his District (Jessore) is such that the price has risen ten times higher than it was formerly."

Agreed that the above letter be inserted in the Proceedings of this day's Meeting with the view of eliciting information on the important subject on which it treats.

Mr. W. Stalkartt remarked that he believed Mr. Veterinary Surgeon Farrell had been specially deputed by Government to enquire into this and other diseases at present prevalent among cattle in Lower Bengal, and he therefore thought it desirable that a copy of Mr. Rainey's letter be also forwarded to the Government of Bengal.—Agreed to.

ANALYSIS OF SOIL FROM SEETAKOTTA.

Submitted the following analysis by Mr. Waldie of soil from Settakotta, on which was raised the fine sample of cotton from acclimatized Sea Island seed by Mr Browning, and reported on by Mr. Joseph Agabeg at the January Meeting —

"The following is the result of my analysis of the sample of soil submitted to me for that purpose. Of the two samples sent, it is the one marked B, stated to be the unmanured soil.

Soil dried at 212° Fah.

Soluble in Hydrochloric Acid	Alumina	2·275	
	Oxide of Iron	2·585	
	Lime	·493	
	Magnesia	·367	
	Potash	·041	
	Soda.	·011	
	Sulphuric Acid, trace.		
	Chlorine, trace.		
	Phosphoric Acid	·028	
	Salica	·040	
			5·840

	Alumina	1 815	
	Oxide of Iron ..	·350	
	Lime	·132	
	Magnesia ...	·067	
Decomposed by Sulphuric Acid	Potash	·003	
	Soda	002	
	Silica, dissolved	·234	
	Silica, not dissolved ...	4 713	
			7 316
Unacted on by Sulphuric Acid, Silica, chiefly in coarse grains of Quartz			82·908
	Total Inorganic constituents		96 064
Organic constituents			
Humic Acid and other Organic matter soluble in hot solution of Carbonic Soda, partly Nitrogenous .		·506	
Other Organic matter, chiefly rootlets and fibres of vegetables		2 670	
			3 170
Loss in Analysis ..			·767
			100·

I have also made a Mechanical Analysis, the results as follows —

Dried at 212°. Fah.

		Of which Organic, Combustible, and Volatile.
Fine gravel, caught in sieve of 20 holes in 1 linear inch	3·32	·25
Coarse sand, caught in sieve of 40 holes in 1 linear inch	23 28	
Fine sand, passed through the last sieve and left by washing	46 71	·32
Portion washed off, finest particles	26 66	2·60
	100·	3 17

"Upon these I beg to submit a few remarks in comparing them with the results of the analysis of Cotton Soil from Mallet's "Science of the Culture of Cotton," as given at page 150 for the Chemical Analysis, and at page 128 for the Mechanical Analysis.

"The general character of the soil is widely different from that of the "Canebrake Soil," analysed by Mallet; this can be readily seen by a comparison of the Mechanical Analysis of the two. While the sample under consideration contains only about 27 per cent. of the finest particles washed off by water, the Canebrake Soil contains above 72 per cent · of coarse sand and gravel this soil contains nearly 27 per cent., the Canebrake less than 1 per cent.

"The Chemical Analysis shows an equal difference, while the Canebrake contains less than 30 per cent of matter unacted on by Sulphuric Acid, this sample contains nearly 83 per cent. The nature of the soluble constituents is the same, and the proportions do not differ very widely, but the quantities are much less. The amount of the constituents soluble in Hydrochloric Acid (which are the only things attended to in most Analyses), including those soluble in water, amount in the Canebrake Soil to 22 65 per cent, while in the present sample the amount is only 5 84 per cent, or about one-fourth of the amount.

"The soil will compare more favorably with other soils of which analyses are given in Mallet's book."

MISCELLANEOUS COMMUNICATIONS.

1.—From Secretary, Board of Revenue, applying for information regarding the culture and preparation of Senna – The Secretary intimated he had given all the information possessed by the Society on the subject.

2.—From Captain W G Young, Settlement Officer, Seetapore, Oude, applying for the three sets of Norton's Tube Wells, at cost price (Rs. 500), on behalf of Raja Ameer Hossein Khan of Mahmoodabad —These have been despatched.

3. From S E Peal, Esq., Seebsaugor, Upper Assam, suggesting the preparation of a Manual on Tea-planting and Manufacture.

The following is extract of Mr Peal's letter —

"Some months ago an idea occurred to me that a small, simple, and cheap 'Manual' on Tea would be of great use to us here in various ways, notably as a means of quickly transferring to beginners and young assistants the experience gained by older men, and which would otherwise have, as is usual, to be bought at both cost and trouble by the new ones. A very large amount of experience has been now gained in Tea, and that is not, as it were, *in circulation*, but confined to those who have given Tea planting some careful study. On writing and speaking to several planters on the idea, they seemed most anxious to see the attempt made and the idea realised, and for my own part, seeing the woeful mistakes so often made, and by so many, I am certain it is a very pressing want. The means by which such a work could be started presented difficulties—first, in selecting men to write the several articles, and secondly, the means of publishing the work. I found more lively co-operation among the younger planters than among some of the *older* ones, and this it was that so damped my idea, that I abandoned it. I am, however, daily more impressed with the necessity of some little book of the kind, and now venture to address you regarding it, as I believe your Society would be anxious to assist, or advise, on such a matter. And it would be most legitimately within its action"

The Secretary mentioned he had brought to Mr. Peal's notice the Essays published by the Society in 1865 on Tea Culture and Manufacture in Darjeeling and Cachar. Some conversation ensued, and it was eventually resolved that the subject be allowed to lie over for the present till further experience has been gained, when it can be again appropriately brought forward for consideration.

4.—From Secretary, Board of Revenue, enquiring the result of the distribution of the Hingunghat Cotton Seed supplied last year The Secretary observed he had communicated in reply the fact, that though widely made known to the public that this seed was available for experimental sowings, very few had applied for it, and no return had yet been received. He had, however, applied for reports.

5—From Messrs Vilmorin, Andrieux & Co, Paris, acknowledging receipt of order for vegetable and flower seeds, and promising it their best attention.

PLANTS EXHIBITED.

Mr Mowbray submitted a plant of *Dendrobium formosum*. The Raja Suttshurn Ghosal showed plants of *Renanthera arachnites, Saccolabium guttatum, Dendrobium Pierardii, Epidendrum crassifolium, Bletia hyacinthina*, and a few others.

Mr. Scott, Curator of the Botanical Gardens, reported that the plant exhibited at last Meeting by Mr. Mowbray, and which he had named doubtfully *Dendrobium Griffithianum*, is *D. sulcatum*, and the other which he was then unable to name is *D. triadenium*. These being both new, the judges (Mr. W. Stalkartt and Dr. Fabre Tonnerre) awarded 5 marks for each.

Wednesday, the 19th May 1869.

J. A CRAWFORD, ESQ., *President, in the Chair*.

THE Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members —

Messrs. W. C. Plowden, C.S., R. M Daly, James Robinson, C.E., the President of the Allahabad Municipality, the Proprietors of the Jugdispore Estate, Rehoea, Baboo Mohesh Chunder Banerjee, and Captain J. H. T. Farquhar.

The names of the following gentlemen were submitted as candidates for election:—

Lieutenant Duncan Macneill, 41st M. N. I.,—proposed by Mr. J. S. Armstrong, seconded by the Secretary.

Secretary, Local Fund Committee, Mozufferguth,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Lieutenant Montague Protheroe, Madras Staff Corps, Assistant Superintendent of Port Blair,—proposed by the Rev. J. Warneford, seconded by the President.

John Dacosta, Esq, Merchant, Calcutta,—proposed by Mr. E. G. Buskin, seconded by the Secretary.

R. J. Crosthwaite, Esq., B.A., C.S., Jaunpore,—proposed by the Secretary, Road and Ferry Fund Committee, seconded by the President.

Dr. G. King, Officiating Superintendent, Botanic Garden, Saharunpore,—proposed by Colonel A. McDonell, seconded by the Secretary.

The following contributions were announced —

1.—Dr. J. L. Stewart's Punjab Plants,—from the Government of the Punjab.

2.—Selections from Records Government of India; papers relating to cattle diseases. Memoirs of the Geological Survey of India, *Palæontologia Indica*, Vol. 6 and Vols. 7-10, and Records of Geological Survey of India, Vol 2, Part 1,—from the Government of Bengal.

3—Journal of the Asiatic Society of Bengal, Part 1 No 1, 1869,—from the Society

4.—Records of the Geological Survey of India, Vol. 2, Part 2,—from the Superintendent.

5.—Report of Proceedings of Meeting held in London in February 1869,—from the Silk Supply Association.

6—A small collection of Orchids from Kurseong,—from C. Graham, Esq. (Transfered to the Botanic Garden.)

7—A small packet of Turkey Opium Seed, stated to be the *very best* produced at Afium-kara-Hisar in Anatolia,—from Dr Forbes Watson (for general distribution).

8—Nankin cotton from the Hill Tracts of Northern Arracan,—from the Commissioner. (Referred to Committee for report.)

9.—Two samples of Caoutchouc from Durrung in Lower Assam,—from Lieutenant Stenhouse, Officiating Conservator of Forests, Lower Bengal. (Referred to Committee for report)

The Council recommend that the vacancies in the list of Vice-Presidents caused by the departure to Europe of Dr Thomas Anderson and Sir R. Temple, and of Mr Jennings to Allahabad, be filled by Dr. Fabre Tonnerre, Mr W Stalkartt, and Colonel Wintle, and that Mr R. Blechynden and Koomar Suttyanund Ghosal Bahadoor fill the vacancies in the Council (To lie over till next Meeting in accordance with Section 5 of Chapter X of the Bye-Laws.)

The Council further submitted a list of irrecoverable subscriptions amounting to Rs. 1,304.—*Resolved*, that the 14 names representing the above sum be removed from the list of members.

The Council also recommend alterations and additions to the Bye-Laws as follows —

That the word "re-admission," be substituted for the word "re-election" in Sections 5 and 2 of Chapters 3 and 4, and that an additional Section be added to Chapter 4, as follows —

"That retired Members, and Members whose names have been removed from the list owing to long absence from India, desiring to rejoin, can do so without any formal re-election, their desire to rejoin being notified for the information and consideration of the Monthly General Meeting, and to be agreed to, or otherwise at such Meeting,"

That the word "three" be substituted for "four" in Section 6 of Chapter 3.

RHEEA FIBRE

The Secretary submitted an application from the Secretary to the Government of India, Home Department, for any information on the records of the Society as to the cultivation of the Rheea plant, especially as to any experiments already made in India, and also for information as to the best mode of procuring seed, and the machines used with most success in preparing the fibre.

The Secretary also submitted copy of a memorandum, which he had sent in reply to the above requisition; and, in connection therewith, drew attention to some particulars inserted in the Proceedings for February last of the Madras Agricultural and Horticultural Society.—

Resolved, that these be introduced in the Proceedings of this day's Meeting to meet frequent applications for information on the subject. The following are the memoranda referred to. —

"The "Rheea" of Assam (*Bœhmeria nivea* of Botanists) is indigenous to Cachar and the North-Eastern Districts of Bengal—Rungpore, Dinagepore—where it is known under the name of "Kunchoora." It is also indigenous to Burmah, and is the "Pan" of the Shan Country, the "Calooe" of Sumatra, and the "Ramee" of the Eastern Archipelago It is identical with the "Chuma" of the Chinese, from which the well-known "China grass-cloth" is manufactured.

"About thirty years ago, Colonel Jenkins, the Commissioner of Assam, sent a few Rheea plants to the Agricultural and Horticultural Society of India. From this a nucleus was formed in the economic portion of their garden, and retained in cultivation till last year, when the entire garden was resumed by Government. From this cultivation of about half an acre, many thousands of cuttings have been distributed over the country.

"The Journal of the Society contains many notices regarding this plant, as published from time to time during the past twenty years, affording much useful information To enumerate these papers would be tedious; moreover, as unfortunately several of the numbers are out of print, an endeavour to refer to them might cause disappointment. I shall, however, give a brief digest of the information such papers afford

"Like several other plants which are readily multiplied by suckers, layers and cuttings, the Rheea does not yield fertile seed. But this is of less consequence, for, as already observed, it can be readily propagated by other means. From a small plot of ground sufficient stock can be obtained in one season to plant out a large area. If the soil be good, and care bestowed on the plants by keeping them clear of weeds, and irrigating when necessary, and the ground carefully drained when too wet, three cuttings may be annually obtained

"The time for cutting is when the plant is in flower, if delayed beyond that period the stalk becomes hard and the fibre harsh

"The most extended cultivation that has been brought to the notice of the Society is that of the Messrs. Morrell, at Morrellgunge, in the Jessore Sunderbund.

The plant thrives most luxuriantly in that locality, and the fibre prepared under their superintendence is, as respects quality and strength, all that can be desired, precisely similar to the Chuma, and such as would command a fair price, say, £70 per ton in the English market But I am given to understand that even this figure will not allow a fair margin of profit after deducting the cost of preparation, and allowing for all other contingent expenses in the shape of land carriage, freight, custom duty, &c.

"The Rheea possesses this advantage over other well-known fibrous-yielding plants (Flax, Hemp, Sunn, Jute) that it is a perennial On the other hand, there is this disadvantage that water steeping or maceration destroys the strength of the fibre. The dry process by hand has been the mode hitherto adopted in India to remove the fibre from the stem. The process adopted by the Chinese is tedious. (See a paper by Dr MacGowan, Corresponding Member of the Society in China, Journal, Vol. vi, page 209.) The Assamese process is so exceedingly slow and expensive,—a man not being able to separate more than half a pound of fibre from the stalks per diem,—that the cost of preparation has hitherto prevented the export from this country (except to a very limited extent) of a fibre which is probably the strongest in the world, and which is capable of being worked into the most beautiful fabrics Several attempts have been made to substitute machinery for hand labor, but, so far as I am aware, all have hitherto proved ineffective"

Extract from Proceedings of the Madras Agricultural and Horticultural Society.—

"Samples of Rheea (*Bœhmeria nivea*, or Chinese grass-cloth plant) fibre, and correspondence regarding them, kindly furnished by the Hon. J C. Loch, were submitted to the Meeting. The Rheea was grown in Bengal, and the cultivator states that he can raise 4 crops in the year, and has discovered some simple process for cleaning the fibre free from all chemical appliances, and far superior to the old retting system, as it extracts every particle of fibre from the bark, and does not impair its strength or colour. The nature of the process is not communicated, but it will doubtless, if its success be confirmed by further experiments, be made public in course of time. The samples were sent to an English Broker, with the view of ascertaining the opinions of manufacturers, 1st, as regards the general quality of the fibre prepared by the new process, 2nd, as to the best mode of packing the fibre for export to England, 3rd, as to the length of fibre required by manufacturers, 4th, as to the value of the trash resulting from the hackling On the first point of enquiry the reply is that the finer specimen submitted for examination, is 'strong, easily made finer, with little waste from hackling, and has a great affinity for dye' which last property, it is subsequently remarked, shows that the cleaning process 'evidently destroys all extraneous matter.' On the second point the reply is to the effect, that the fibre should not be strongly compressed in the bundles in which it is put up, as it sticks together and gets entangled if wetted to facilitate separation, and that great care should be taken to keep the ends even.

"Regarding the length of fibre required it is stated, that the minimum should be 2 feet as such fibre is suited for fine purposes, produces much less waste in hackling, and is much more valuable than shorts. The grower on this head states, that from hot weather crops of the plant the average length will not exceed from 3 to 4 feet, and from monsoon crops, from 5 to 6 feet, and the latter length only from selected shoots.

"As to the commercial value of the trash it is stated, that some of it can be converted into cord, and that an eminent paper maker who had seen it, pronounced it to be one of the best articles for paper-making, and that it would sell readily in almost any quantity at £10 per ton. The report concludes thus: "If the bulk come to hand equal in quality to the samples, it would no doubt be an article of great utility here. It is in my opinion preferable in every respect to Sunn or Bombay Hemp. The trash produced by hackling the 1st and 2nd samples, strongly resembles fine Italian tow." In the Proceedings of the Society for May 1868, a communication from the American Vice-Consul at Bradford to the Secretary of State for India is published, pointing out that by some chemical process the Rheea fibre could be converted into a material which would enable the manufacturers to employ it as a substitute for Mohair or worsted, in making up certain dress fabrics, and that for that purpose alone it was worth in London about £70 per ton.

"The Rheea plant was introduced into this Presidency about two years ago by the Society, and distributed to Coorg, Bangalore, &c., where it is now fairly established. What is now chiefly wanted is some simple machine or process for cleaning the fibre, and it is to be hoped that the one referred to in this notice will soon be made available, under patent or otherwise, to the public.

"Mr. Loch kindly offered to ascertain if any information could be got from the cultivator of the Rheea, as to his mode of cleaning the fibre."

Request for information towards adding to the Agricultural resources of Egypt.

Read the following letter from Mr. W. L. Heeley, c.s., dated from Rampore Bauleah, 10th May.—

"I shall be obliged if you will lay before the Agricultural and Horticultural Society at their next meeting the enclosed set of questions, communicated to me by Major-General Maclean of the Madras Army, who is at present engaged as tutor of the son and heir of the Viceroy of Egypt.

"The Viceroy has had his attention called to agriculture, and is particularly anxious to improve the condition of the half-starved cattle of Egypt. It has struck General Maclean that the conditions of the Gangetic Delta are so like those of the Delta of the Nile, that in all probability any crops grown in the former, might be found to suit the latter, and I feel sure that the Society will willingly procure for me the information which will enable an experiment to be commenced in Egypt with a view to improving the condition of the cattle of the country."

Extract from General Maclean's letter —

"The Egyptian Government are desirous to try the cultivation of various Indian Cereals, and would be thankful for any information on the subject—food for cattle is a great want in the country.

(1.) Would "Bengal Gram" suit the climate and soil of Egypt?
(2.) In what way is it cultivated?
(3.) How much water does it require?
(4.) In what month is it sown?
(5.) What is the yield per acre?
(6.) Is it a remunerative crop?
(7.) What is the usual feed for a horse, and for a sheep, per day?
(8.) How is it prepared?
(9.) Is there any other grain that will feed sheep and cows?
(10.) What grains are sown on dry land? At present immense tracts of land lie waste whenever there is a "bad Nile." It is very desirable to find some good producing grain that does not require much water.
(11.) Are there any oil-seeds to suit Egypt?
(12.) What is the price of Bengal gram?

"Please give English weights if possible, or French."

Resolved—That the above letter and queries be introduced in the Proceedings of this day's Meeting, with the view of eliciting replies thereto.

MISCELLANEOUS COMMUNICATIONS.

The following letters were read:—

1.—From the Officiating Junior Secretary, Government of Bengal, in reference to Mr. Rainey's communication, submitted at the last meeting, respecting a cattle disease called "Pachima," and stating in reply to the Society's suggestion, that Mr. Veterinary Surgeon Farrel has been deputed for the purpose of enquiring into the nature of, and endeavouring to check such disease, and in teaching the people how to treat it by simple remedies.

2.—From the Officiating Under-Secretary, Government of Bengal, stating that a question having arisen regarding the advantages of using the fibre of the Aloe for stuffing mattresses for troops, the Lieutenant-Governor would be glad for any information the Society can give regarding the varieties of the plant said to thrive in Lower Bengal.—Replied to.

3.—From Dr. J. D. Hooker, returning thanks for a copy of the Society's Journal and promise of dispatch of subsequently published numbers, which are most useful for the Museum Department at Kew. Dr. Hooker states he will send a quantity of mahogany seed as soon as his next supply from Jamaica is received.

4.—From A. Grote, Esq., London, 13th April. Mr. Grote writes that he has been in communication with Messrs. James Carter & Co., in respect to their supply of seeds for the approaching season, and approves of the arrangements they are making to secure vitality.

5.—From Messrs James Carter & Co., London, 15th April, acknowledging receipt of order for seeds, promising it their best attention, and proposing to despatch it per *Calcutta*.

6.—From Messrs. D. Landreth and Son, Philadelphia, March 30th, advising despatch on 10th March of consignment of seeds for this year per *Cromwell*, direct from Boston to Calcutta.

Mr Mowbray submitted two fine plants, in full flower, of *Saccolabium guttatum*, and Mr Lynam one of *Ærides*, closely approaching to *Æ. affine*.

For the above contributions and communications the best thanks of the Society were accorded.

Wednesday, the 16th June 1869

J. A. CRAWFORD, ESQ., *President, in the Chair*

The Proceedings of the last Meeting were read and confirmed

The following gentlemen were elected Members.—

Lieutenant Duncan Macneill, Secretary, Local Fund Committee, Mozufferghur, Lieutenant M. Protheroe; Messrs. John Dacosta, R. J. Crosthwaite, and Dr. Geo: King.

The names of the following gentlemen were submitted as candidates for election —

The Hon'ble Sir Wm Muir, K.C.S.I., Lieut.-Governor, N. W. Provinces,—proposed by Mr. Samuel Jennings, seconded by the Hon'ble C. A. Turner

Dr. H. J. Hazlett, Madras Army, Dumagudiem,—proposed by Mr. J. Glass, seconded by the Secretary.

Major Geo. Weld, Commandant, Chunar,—proposed by the Secretary, seconded by the President.

Baboo Ram Doss Sen, Berhampore,—proposed by Coomar Harendra Krishna Bahadoor, seconded by Baboo P. C. Mittra.

Geo. Bickham, Esq., Merchant, Calcutta,—proposed by Mr. T. H. Moseley, seconded by the Secretary.

Walter H. Brown, Esq., Merchant, Calcutta,—proposed by Mr. Moseley, seconded by the Secretary.

The Rajah of Bhadawur, Agra,—proposed by Mr. Henry Dashwood, seconded by the President.

Mr R. H. Heseltine, Rajpore, near Mussoorie,—proposed by Mr. C. Nickells, seconded by the Secretary.

The following contributions were announced:—

1.—Report of the Agricultural and Horticultural Society of Western India, from January 1866 to May 1868,—from the Society.

2.—Report of the Bombay Chamber of Commerce for the year 1867-68,—from the Chamber.

3.—Journal of the Asiatic Society of Bengal, Part 2, No. 2, 1869,—from the Society.

4.—Monthly Report of the Department of Agriculture at Washington, for February 1869,—from C. H. Bailey, Esq.

5.—A box of seedlings of the "Nagkeesur," *Mesua ferrea*, from Rangoon,—from Joseph Agabeg, Esq.

6.—A quantity of seed of New Zealand Flax, *Phormium tenax*,—from J. C. Wilson, Esq., of Canterbury, New Zealand (for distribution).

7.—A small quantity of Bamboo seed from Pertapghur, Oude,—from J. D. Gash, Esq.

8.—Mignonette seed raised at Umritsur,—from H. Cope, Esq.

9.—Mignonette seed raised in the garden of the Agricultural and Horticultural Society of the Punjab,—from the Society.

10.—An assortment of *Coniferæ*, Rhododendron, and other Hill seeds,—from Dr. Geo. King, Officiating Superintendent of the Botanic Garden, Saharunpore, (for distribution).

11.—Fruit of the Lullum lutta, (*Willoughbeia edulis?*) and seeds of other jungly fruits of Cachar,—from C. Brownlow, Esq.

12.—Cotton raised at Seetakotta from Sea Island stock, by Mr. F. R. Browning, and a small quantity of the seed.

This Cotton is from the small plantation which produced the fine sample so favorably reported on by Mr Joseph Agabeg at the January Meeting. The seed is for distribution.

The vacancies in the list of Vice-Presidents referred to at the last Meeting were filled by the nomination of Dr. C. Fabre Tonnerre, Mr. W. Stalkartt, and Col. Wintle. Mr. R. Blechynden and Coomar Suttyanund Ghosal Bahadoor, were also appointed to fill vacancies in the Council. Messrs. W. Pigott and J. P. Thomas were recommended by the Council to fill the remaining two vacancies. (To lie over till next Meeting in accordance with section 5 of Chapter X of the Bye-Laws).

The alterations and additions to the Bye-Laws, as set forth in the last month's Proceedings, were brought forward and carried unanimously.

DISTRIBUTION OF PLANTS TO MEMBERS FROM THE ROYAL BOTANICAL GARDENS.

Read correspondence with the Government of Bengal, relative to the terms on which the Government is willing to supply to the indent of the Society, ornamental plants and fruit grafts to meet the requisition of its Members, and which are as follows:—

That a nursery be formed and kept up for four years at a monthly cost of Rs. 209-8-0 to the Society, for the sole duty of raising ornamental plants and grafts of fruit trees for distribution to its Members, to be limited annually to 10,500 ornamental plants, and 1,500 grafts of fruit trees.

That flowering plants, ornamental shrubs, and seedlings raised in such nursery, shall be supplied free of charge to the Society.

That for fruit trees grafted on purchased stock, for pots, Wardian cases and boxes, the Society will be charged the cost price.

That it shall be optional with either party to terminate the agreement at any time during the period of 4 years, on six months' clear notice.

These terms were agreed to, and the Society is now prepared to issue delivery orders on the above terms, *viz*, for ornamental plants free of charge, but all fruit grafts, pots, boxes, and Wardian cases to be paid for (as previously) to the Curator of the Royal Botanical Gardens, at the nursery, at the time of taking delivery.

COTTON FROM THE HILL TRACTS OF NORTHERN ARRACAN.

Read the following letter from the Superintendent of Hill Tracts, Northern Arracan, to the Commissioner of Arracan, and re-submitted the sample of cotton therein referred to, which was placed on the table at the last Monthly Meeting —

"I beg herewith to forward you a sample of some tawny-coloured Cotton which I found during my last visit to upper Koladan. This cotton is not cultivated in large quantities as the white cotton is preferred, and nearly all that is cultivated is used by the Khyoung-tha tribe alone, for weaving waistcloths for elderly people. It is said to be indigenous to the hills, and is cultivated in the same manner as the white cotton, described before. The plant of the yellow or tawny-coloured cotton is said to be almost undistinguishable from that of the white species, until it flowers, the flower being of a dark yellow colour. I am informed that this species yields a very fine crop. The hill people consider this cotton to be equal to white cotton in every respect, but the colour of it is disliked The sample herewith sent had to be taken from an inferior lot as there was not any more procurable."

Mr. Buskin, a member of the Cotton Committee, reports the cotton to be so short and weak in staple that he does not think it would suit this market at all; but he is unable to say whether it can be used by the home trade or not.

CAOUTCHOUC FROM THE DURRUNG DISTRICT, ASSAM.

Read also the following letter from the Officiating Conservator of Forests, Lower Provinces, and re-submitted the samples of Coutchouc therein referred to :—

"I have the honor to forward you two specimens of India Rubber manufactured in the Durrung district of the province of Assam, and to solicit the favor of a report by the Committee of your Society as to the quality of the Rubber compared with that imported from Mexico, the Brazils, Africa, or other parts of the world.

"As it is very important to ascertain the value of this Rubber compared with that derived from other quarters of the globe, and the measures by which its quality can be improved, I would request the favor of your forwarding the two samples now sent to the Reporter on Indian products, India Office, London, and of your furnishing me with a copy of his report when received I send you a printed copy of a Report on the Caoutchouc Forests by Mr Mann, the Forest Officer deputed to Assam, in which you will find a description of the mode of collecting and manufacturing the two kinds of Rubber now sent"

Mr. C H Bailey reports the sample to be of good, fair quality, and worth Rs 35 per bazaar maund The dishonest practice of filling the balls with mud is, Mr. Bailey observes, a serious drawback to any one shipping it home.

Resolved—That this sample be sent, as requested, to the Reporter on Indian Products, and that Mr Mann's paper be published in the next Number of the Journal.

INSECTS INJURIOUS TO TEA PLANTS

Read the following remarks by Mr W S Atkinson on the caterpillars received from Assam, and referred to in the Proceedings for February last —

"The bottle I find contains *larvæ* of three distinct species all Lepidopterous.

"1 —A borer feeding in the pith column of the stem, probably belonging to the Bombycinæ

"2 —An ordinary leaf-feeder one of the Nocturnæ

"3 —One of the 'Sacktragers of German entomologists of the genus *Oiketicus*, and not improbably *Oik. Cramerii*, described by Westwood from Ceylon, but which I have obtained in Bengal See Proceedings, Zoological Society, London, for 1854, page 236 The larva case in the figure which is supposed by Westwood to belong to this species, is certainly of a different species, as I have bred *Cramerii* myself from larvæ, whose "sacks" closely resemble those in the bottle

"It seems almost omnivorous I have found it on plants of all kinds"

RHEEA

Read a letter from H Rivett-Carnac, Esq , Cotton Commissioner, C. P , and the Berars, of which the following are extracts —

"I should be much obliged by your sending me by dâk banghy a parcel of Rheea seed, as I am anxious to try some experiments with this plant in the cotton seed gardens which have recently been sanctioned by His Excellency the Viceroy

"Mr Lionel Ashburner, C S , whose name is doubtless well known to your Society, from the improvements effected by him in the cotton cultivation of Khandeish, is also anxious to attempt the Rheea cultivation in his Division, and has made enquiries about seed, and, on receipt of your packet, I will send him a small quantity.

"I should also be obliged by any details you can give me of the best mode of cultivation, and any other particulars regarding the produce"

The Secretary mentioned that he had informed Mr Rivett-Carnac that since the resumption by Government of the Society's Garden, the distribution of Rheea plants and other useful products had ceased. He had applied to the Curator of the Royal Botanic Garden, but he was unable to meet this requisition.

A letter was also read from the Deputy Commissioner, Hill Tracts, Chittagong, stating that the Rheea plant sent to his predecessor by the Society were first tried on high ground and failed, but were again tried on low, flat, damp ground, and had succeeded. Major Graham now applies for information as to treatment, &c &c.

The Secretary mentioned he had sent the required particulars. In connection with the above, the Secretary read the following note from Mr. J. M. Ross:—

"At a recent interview I called your attention to what I believed to be an inaccurate valuation of "Rheea Fibre" in the London Market, given by you to the Society in a recent publication on the subject. I therefore address you with a view to correcting the statement, if your Committee agree with my view of the case. I am informed that the price of the fibre in London is subject to great fluctuations, according to supply, and that no precise figure can be named as one safely to be depended upon. Thus I have notice of purchases made last year of the best China article as low as £30 per ton, and although occasionally a good deal higher price has been paid, yet in no instance has the price approached your valuation, say £70 per ton."

The Secretary stated that his valuation was based upon an offer made to him in England of £70 per ton for Rheea fibre from Assam, similar to sample he had presented to a dealer, when China-grass was selling at £80 per ton. He was not aware the fibre was subject to such great fluctuations, or that it had recently fallen to so low a figure as £30 per ton, as stated by Mr. Ross.

FLOWERING OF THE BAMBOO IN OUDE.

Read the following letter from J. D. Gash, Esq., of Pertabgurh in Oude, on the above subject:—

"This year nearly all the thinner kinds of Bamboos in this neighbourhood are in flower. I send you by dâk banghy a small parcel contaning both seed in the shell and cleaned seed, and will feel obliged by your informing me whether the seed sent you last year by Mr. Macalpine from Chittagong was of the same description or not. In the extract of Mr. Macalpine's letter, published in the Society's Journal, it states the seed to be like paddy, but this which I send looks very much like the inferior kind of wheat one meets in the bazar, although the poorer classes use it the same way as the seed of the paddy, *i e*, by boiling it as rice. The seed I send you grows on the joints of the smaller branches in regular clusters of six or eight at each joint.

"There are four descriptions of bamboos grown here, the Chah, the Lore, the Kutwasee, and the Phoolbassa. The flowering this year is confined principally to the Kutwasee, but a few clumps of the Chah are as well in blossom.

"From enquiries made I find that the last occasion of the bamboo flowering was some twenty-five years ago, but then it was not so general as the present one, being confined to certain places only.

"According to the native idea, the trees which are in blossom ought to be cut down at once, otherwise next year's shoots will be effected. Could you give me any information on this point?

"It is my intention of sowing some of the seed so soon as rain falls, to see if it will germinate. Should I succeed, I will inform you at once."

The Secretary mentioned that he had informed Mr. Gash that the flowering shoots always die when the seed has ripened, but the roots do not die, and young shoots spring therefrom in due time. These shoots are not affected by allowing the withered stems to remain; indeed, it is considered better not to disturb them till the new stems have attained a good growth and strength.

MISCELLANEOUS COMMUNICATIONS.

1.—From Captain Thos. Hutton, Corresponding Member, Mussoorie, forwarding an interesting paper on Silk Cultivation in India. The best thanks of the Society were accorded to Captain Hutton, and his paper was transferred for publication in the next number of the Journal, now about to be commenced on.

2.—From Dr. H. Cleghorn, Corresponding Member, Edinburgh, forwarding a copy of his observations on the Forest Schools of Europe. Transferred for publication

3.—From A. Grote, Esq., Honorary Member, London, a few more remarks regarding Carter's consignment of vegetable and flower seeds, which have been despatched by the *Calcutta.*

4.—From Monsr. A. Jacquemin, French Consul General, announcing the formation, at Paris, of the Society of Agriculturists of France, and expressing their desire to enter into correspondence with this Society. M. Jacquemin sends a copy of the rules of the Society, list of Officers, &c.

Resolved—That the Society cordially reciprocate this request, and desire that a copy of the Journal (new series) be forwarded to the newly-formed Association.

5.—From the Deputy Commissioner of the Oomrawuttee District, seeking information in respect to the culture and manufacture of Tobacco.—Complied with.

6.—From Messrs Betham and Blackith, London, enclosing Bill of Lading per *Calcutta* for 16 cases of French vergetable and flower seeds from Messrs. Vilmorin, Andrieux & Co., of Paris.

7.—From A. H. Mowbray, Esq., Darjeeling, stating that the plants submitted by him at the last meeting were *Ærides Lobbii*, and not *Saccolabium guttatum* as erroneously entered.

For the above communications and contributions the best thanks of the Society were accorded.

The usual Monthly General Meeting was held on Wednesday, the 21st July 1869.

J. A. CRAWFORD, ESQ., *President, in the Chair.*

THE Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members —

The Hon'ble Sir Wm. Muir, Dr. H. J Hazlett, Major Geo. Weld, Baboo Ram Doss Sen, Messrs. Geo. Brickham, Walter H. Brown, R. H Heseltine, and the Rajah of Bhadawur.

The names of the following were submitted as Candidates for election —

Mrs. E. Reilly, Mussoorie,—proposed by Col D. Gaussen, seconded by Dr. G. Banister.

Percival Bury, Esq., Tea planter, Cachar,—proposed by Mr. R. Blechynden, seconded by Mr. S. H Robinson

Major F. J. Miller, Deputy Commissioner, Sealkote,—proposed by the Secretary, seconded by the President.

Vilters Berkeley, Esq, Judge, Small Cause Court, Agra,—proposed by Mr. L. Berkeley, seconded by the Secretary.

Achille Courjon, Esq., Chandernagore,—proposed by Mr. Alfred Courjon, seconded by the Secretary.

Henry Colville Marinden, Esq., Barrister-at-law,—proposed by Mr. J. Pitt-Kennedy, seconded by Mr. Joseph Graham

W. C. Bannerjee, Esq., Barrister-at-law,—proposed by Mr. Kennedy, seconded by Mr. Graham.

Dr. Roderick Macleod, Civil Surgeon, Chuprah,—proposed by Mr. Alexander Hope, seconded by the Secretary

J. W. Edgar, Esq, C.S., Cachar,—proposed by the Secretary, seconded by Mr. R. Blechynden.

A. Forbes, Esq., C.S., Beerbhoom,—proposed by Mr. C. H. Wilson, seconded by the Secretary.

Robert White, Esq, Tea planter, Cachar,—proposed by Mr. Geo. Grace, seconded by the Secretary

F. C. Mahony, Esq., Tea planter, Cachar,—proposed by Mr. Grace, seconded by the Secretary.

Secretary to the Municipal Committee, Mirzapore,—proposed by Dr. Charles T. Paske, seconded by the Secretary.

A. Spicer, Esq., Tea planter, Cachar,—proposed by Mr. W. Alexander, seconded by Mr. H. Knowles.

Geo. Sibley, Esq., Chief Engineer, E. I. Railway,—proposed by Mr. Cecil Stephenson, seconded by the Secretary.

James Young, Esq., Merchant, Calcutta,—proposed by Dr. G. R. Ferris, seconded by the President.

The Secretary intimated that Messrs. J. D Ward, c.s., of Rampore Beauleah, and J. T. D. Cameron of Calcutta, wished to rejoin the Society.—Agreed to.

Messrs. W. Pigott and J P. Thomas were appointed to fill vacancies in the Council, due notice of the same having been given at the last Meeting.

The following contributions were announced —

1.—Monthly Report for March and April 1869 of the Department of Agriculture of Washington,—from C H. Bailey, Esq, Vice-Consul, U S A.

2—Report of the Committee of the Bengal Chamber of Commerce, from November 1868 to April 1869,—from the Chamber.

3.—Journal of the Asiatic Society of Bengal, Part 1, No. 2, 1869,—from the Society.

4—Report on the Botanic Garden, Calcutta,—from the Officiating Superintendent.

5—Seed of the Deodar,—from Dr. Geo King, Superintendent, Botanic Garden, Saharunpore.

6—A farther small quantity of bamboo seed from Pertabghur, Oude,—from J D. Gash, Esq

7.—Seeds of wild fruit from Cachar the "Borbor" and "Cowa," and plants of *Vanda cerulea*,—from C Brownlow, Esq

8.—A few bulbs from Dhurmsala,—from General Charles Prior. General Prior mentions that these bulbous plants yield a very pretty crocus like flower, white and pink.

SILK CULTURE AT THE CAPE OF GOOD HOPE.

Read a letter from the Secretary; Agricultural and Horticultural Society, Cape of Good Hope, on the above and other subjects, of which the following is an extract:—

"As the Steam-Ship *Hindostan* will be leaving in a day or two for Calcutta, I take the opportunity of acknowledging, with best thanks, your kind offer of silk-worm eggs. I am happy to say that we have received very favorable reports of the cocoons which were forwarded by the Government to the Crown agents in London. Some of the silk has been manufactured into handkerchiefs, which, in point of texture and richness, appear to be very beautiful specimens, and will certainly stimulate our silk-growers to persevere in this new branch of industry. When opportunity may offer, and the eggs are in fit condition for transmission to the Cape, our Silk-Commission and Committee of this Society will feel much obliged by the despatch of whatever you can spare. We have a mulberry in the Colony which some botanists pronounce to be indigenous to South Africa, whilst others maintain that the variety was originally brought by some enterprising Dutchmen from Japan. This mulberry scarcely loses its leaves throughout the year. In my own garden the trees are never without foliage. We have therefore a supply of wholesome and nutritious food always at hand. The Colonists, however, are rapidly extending their plantations of the French white mulberry, in the belief that it will produce a finer quality of silk than the samples which have been hitherto exported to Europe. I enclose an extract relative to the last shipment of cocoons, the produce of worms fed only on the Cape mulberry, and which is found in almost every district of the Colony, many farmers using it as a line fence round their vineyards. Any information on this subject will be acceptable, as silk may now be fairly included amongst our new products. Mr. F. G. Chapman, of the Central Provinces, is at present staying in Cape Town, and daily expecting a large number of tea plants for his recently-purchased estate at Natal: he has kindly offered to distribute a few hundreds of them for trial at this end of the Colony, and many no doubt will be glad to experimentalise with the chance of eventually acclimatising the plant.

"The culture of linseed and cotton is also making satisfactory progress, and with our fine climate, and other advantages, if we only had a more industrious and painstaking native population, we might largely develope our agricultural resources."

Resolved—That Mr. Holding be requested to forward samples of the above silk by the first opportunity.

Letters were also read:—

From the Under-Secretary, Government of Bengal, forwarding copy of a letter to the Officiating Superintendent, Botanic Garden. announcing the arrangements made (as detailed in last Month's Proceedings) for distribution of plants to the Society.

From the same, forwarding extract of letter from the Officiating Superintendent, Botanic Garden, regarding damage done by the gale of the 9th June last.

From the Collector of Monghyr, requesting information regarding the drying and preparation of the tobacco leaf—Complied with.

From C. Brownlow, Esq., Cachar, forwarding a paper for the Journal on the orange groves of Shalla.

From H. Rivett-Carnac, Esq., Cotton Commissioner, Central Provinces and the Berars, forwarding copy of a letter addressed to the Chamber of Commerce, Bombay, on the subject of last season's operations in the Central Provinces and the Berars.

From the Secretary, Agricultural and Horticultural Society, Lahore, returning thanks for seeds and copies of the Journal.

From Messrs. James Carter & Co., London, enclosing bill of lading and lists of vegetable and flower seeds forwarded per *Calcutta*.

From Messrs. Vilmorin, Andrieux & Co., Paris, forwarding invoice of vegetable and flower seeds shipped per *Calcutta*.

Mr. Lynam submitted a fine healthy plant, in flower, of *Oncidium Papilio*, for which eight marks were awarded.

Wednesday, the 18th August, 1869.

J. A. Crawford, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following were elected Members :—

Mrs. E. Reilly, Major F. J. Miller, Messrs. Percival Bury, Vilters Berkely, Achille Courjon, H. C. Marinden, W. C. Banerjee, Dr. Roderick Macleod, Secretary to the Municipal Committee, Mirzapore; Messrs J. W. Edgar, A. Forbes, Robert White, H. C. Mahony, A. Spicer, Geo. Sibley, and James Young

The names of the following gentlemen were submitted as candidates for election :—

H. Rivett-Carnac, Esq., Cotton Commissioner, C. P. and the Berars,—proposed by Mr. J. A. Crawford, seconded by Mr. A. Stirling.

A. Christian, Esq., Junior, Comgong factory, Mudhoobanee, Tirhoot,—proposed by the Secretary, seconded by Mr. Crawford.

Maxwell Smith, Esq., Hursingpore, Tirhoot,—proposed by Mr. Cunnigham Hudson, seconded by the Secretary.

W. Lloyd, Esq., Darjeeling,—proposed by Mr. Charles Grant, seconded by the Secretary.

Thomas S Isaac, Esq , Superintending Engineer, Cuttack,—proposed by Mr E Molony, seconded by Mr. W. Macpherson

Lieut.-Col. F. J. Davies, Executive Engineer, Burdwan,—proposed by Mr. A. Eliott Russell, seconded by the Secretary.

Alexander Landale, Esq., Merchant, Calcutta,—proposed by Mr. W. Alexander, seconded by the Secretary.

Secretary, Local Fund Committee, Baitool,—proposed by the Secretary, seconded by Mr. Crawford.

H. G. Turner, Esq , Madras Civil Service, Bimlipatam,—proposed by Mr. Charles Minchin, seconded by Mr. A. Hyslop.

D. R. Lyall, Esq., c s., Tipperah,—proposed by Major G. B. Fisher, seconded by the Secretary.

H. F. Payne, Esq , E. B. Railway, Calcutta,—proposed by Mr. E. G. Buskin, seconded by the Secretary.

The Revd. H. Onarsh, Purulia, Maunbhoom,—proposed by Mr. Frederick Wilcox, seconded by Mr. A. L. Clay.

The Rev. J. B. Archer, Purneah,—proposed by Mr. J. B Worgan, seconded by the Secretary.

Capt. H. D. E. W. Chester, Officiating S. A. C. G., Benares,—proposed by Dr. R. H. Perkins, seconded by the Secretary.

Howard Unwin, Esq., C.E., Irrigation Dept., Burdwan,—proposed by Capt. W. H. Garnault, seconded by Mr. A. Eliott Russell.

Chester Macnaghten, Esq., Tutor, Durbungah Raj,— proposed by Mr. W. H. Stevens, seconded by the Secretary.

Henry A. Gray, Esq., Solicitor, Calcutta,—proposed by Mr. J. G Meugens, seconded by Baboo Peary Chand Mittra.

The Secretary intimated that Major-General Travers and Mr. A. B F. Thompson wished to rejoin the Society.—Agreed to

Messrs J. P. Thomas and J. M. Ross were elected to fill vacancies in the Cotton Committee.

The following contributions were announced :—

1.—Progress Report of Forest Administration in Mysore for 1867-68,—from Government of India, P. W. D.

2.—Report on the progress and condition of the Royal Gardens at Kew,—from Dr. Hooker.

3.—Report on the Cotton Department for the year 1867-68,—from the Cotton Commissioner, C. P. and the Berars.

4.—On the Introduction and acclimatization of Cinchona in Netherlands, India, and the British Indies, by J. L. Souberan, and Auguste Delandre,—from the Authors.

5.—Records of the Geological Survey of India, Vol. 2, Part 3,—from Dr. Oldham.

6.—A paper by Mr. Frayer on Indian Coal Mining,—from the Government of Bengal.

7.—Indian Mineral Statistics—Coal,—from Dr. Oldham.

8.—Journal of the Asiatic Society of Bengal, Part II, No. 3, 1869,—from the Society.

9.—Report of the Lawrence Asylum for year ending March 1868,—from the Principal.

10.—A Model of a Machine used by the Natives of Hazareebaugh for expressing oil from the Mohwa nut,—from Mr. C. J. Dumaine.

11.—Seed of Mahogany and of Manilla Tobacco,—from Dr. J. D. Hooker. (For distribution.)

12.—A few seeds from New Zealand,—from Mr. John Thomson.

13.—A plant of *Iresine Herbstii* and of *I. aureo-reticulata*,—from R. M Daly, Esq.

Patent Chemical Manures.

Submitted a letter from the Secretary to the Government of India, Home Department, in reference to Crofton's Patent Chemical Manures. Messrs. C. H. Crofton and Co. state that, having been informed that Her Majesty's Government in India intend to afford every assistance in their power for the advance of agriculture in the promotion of the growth of Cotton, Rice, Tea, &c., they enclose circular on Patent Chemical Manures, and intimate that they have made arrangements for a succession of importations into India from Australia.

The Government, in reply, have requested Messrs. Crofton to supply them with two tons of this manure,—one ton to be delivered in Calcutta to the Assistant

Secretary to the Government of India in charge of the Home Office, for distribution to the Botanical Gardens in Calcutta and Saharunpore, and the several Agricultural Societies in the Bengal Presidency, and the other to the Government of Bombay, for transmission to Mr. Rivett-Carnac, Cotton Commissioner of the Central Provinces and the Berars.

The Council suggest in reference to the above, that though the Society are themselves unable to give a fair trial to the manure in question in, consequence of the resumption by Government of their garden, yet that the offer be accepted, and that on receipt it be judiciously distributed among such Members of the Society as are prepared to test it carefully, and to report the result.—This was agreed to.

MODEL FARMS.

Read a letter from Mr. Vause Fretwell, Superintendent of the Government Model Farm, Bhurgam, Kandeish, of which the following is an extract —

"Having been instructed to place myself in communication with all the Agri-Horticultural Societies and kindred Institutions in India, with a view to experiments in the acclimatization of exotic plants, and the improvement of such as we possess by hybridization or selection, I hasten to address myself, in the first place, to you, and to solicit the favor of your aid toward this object.

"2. I shall feel obliged for any seeds of plants (the products of which are of commercial or economic value, either as food, dye-stuffs, fibres, oil-stuffs, timber, fodder or medicines), which we are not known to possess in this province; and for such information as you may from time to time be able to afford me as to new species or improved methods of extracting the various products.

"3. If I can be of any service to your Society in return, I shall be most happy to do all in my power to assist their objects, and to communicate the result of such experiments as may be carried out here.

"4. I shall further feel obliged for information as to whether any satisfactory machine, or method of manipulation, has yet been discovered for extracting the fibre of the *Urtica nivea* economically.

"5. Amongst other seeds, I should wish, if possible, to have those of the *Rhamnus chlorophorus* and *R. utilis*, if procurable"

The Secretary intimated that he had partially responded to the above application. He was, however, unable to meet Mr. Fretwell's request in the last portion of his letter for seed of the China green-dye plants. These plants were formerly cultivated to some extent in the economic portion of the Society's late garden. Nor was he able to procure any from the Curator of the Royal Botanic Garden, as he had none in stock.

Letters were read :—

From the Assistant Secretary, Government of India, Home Department, complying with request for certain works (Beddome's Ferns and Icones, &c.) for the Society's Library.

From J. D. Gash, Esq., of Jugdesgurh, Oude, giving, as promised, the result of his sowings of the bamboo seed, a portion of which he has forwarded to the Society. The following is extract of Mr. Gash's letter:—

"After the first fall of rain in July, I sowed some of the unhusked and husked seed, the former along the bottom of a side-walk in my garden, and the latter in a part of a field near my house. The unhusked seed sown was neither weighed nor counted, but the husked, of which I had my doubts, was counted, and out of a 1,000 grains sown only thirteen came up, or about $1\frac{1}{4}$ per cent; the unhusked germinated more freely, but even that was under the quantity put in; I should say about 30 per cent. was what came up. The seed takes from ten to twelve days germinating, and the first appearance of the young plant is something like that of the *Cyperus rotunda* or *Motha* grass. After five days the two first leaves are perfectly distinguishable, and the plant looks like the Bamboo but before that one could not tell it from the *Motha* grass, the resemblance is so great.

"Large quantities of bamboo seedlings are to be found under the clumps which seeded this year, and they seem to thrive much better than those taken care of in the nursery."

From John Scott, Esq., Curator, Royal Botanic Garden, giving, in a tabular form, the result of his trial sowings of the American vegetable seeds. Mr. Scott reports that "the peas are especially good, though all indeed are of excellent quality; and I have no doubt that the failures are due to the unfavorableness of the weather, as the seeds on examination looked sound. I shall try them again in the beginning of the cold season."

From A. Grote, Esq., London, July 7th, intimating that the sample seed selected by him at random from those which were being shipped to the Society by Messrs. Carter & Co., have germinated most successfully. Mr. Grote mentions he has been trying the success of Carter's new method of sending plants to America and the Continent, and he has found them full of life after three weeks, when packed in moss within an oiled-silk envelope.

From the Secretary, Agricultural and Horticultural Society, Lahore, returning thanks for seeds.

From Claude Dumaine, Esq., submitting three short papers. (1), descriptive of the mode pursued by the ryots of the zillah of Hazareebaugh for extracting the oil from the nut of the "Mowah" tree; (2), of extracting the oil from the nut of the "Bhela"; and (3), of the mode of preparing the Cutch of commerce. (Transferred for Journal.)

Mr. John Lynam exhibited a fine plant in flower of *Phalænopsis rosea*, to which eight marks were awarded.

BYE-LAWS.

CHAPTER I.

OBJECT.

The promotion and improvement of the Agriculture and Horticulture of India constitute the object of the Society.

CHAPTER II.

CONSTITUTION.

The Society consist of Members, Honorary and Corresponding Members, and Associates.

CHAPTER III.

PROPOSAL AND ELECTION OF MEMBERS.

Section 1.—Persons of every nation shall be eligible as Members of the Society.

Section 2.—Candidates for admission as Ordinary Members shall be proposed by two Members at a General Meeting, and ballotted for at the succeeding Meeting, when a majority of votes shall determine the election.

Section 3.—Persons so elected shall have immediate notice thereof transmitted to them by the Secretary, accompanied by a copy of the Bye-laws, and a printed letter to be duly signed and returned, acknowledging the receipt of their election as Members, and agreeing to consider themselves bound by the Bye-laws.

Section 4.—Ordinary Members shall pay an Entrance Fee of 8 Rupees. They shall be liable for the full subscription for the quarter in which they may have been elected.* The subscription of Ordinary Members shall be 32 Rupees per annum, payable quarterly in advance, in sums of 8 Rupees. It shall be optional for any Member to compound for the quarterly contributions by the payment of Rupees 320 to the funds of the Society.

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* See Privileges of Members, Chapter 5, Section 5.

Section 5.—A Member retiring from the Society shall be exempted from the payment of a second admission fee on re-admission.

Section 6.—Members whose absence from India shall not extend beyond three years, shall continue to be borne on the list of Members, but shall be exempt from the payment of subscriptions until their return to the country.

Section 7.—When any Member shall be six months in arrear of his subscription, or otherwise indebted to the Society, he shall receive the usual ordinary notice of the same; and in the event of his not remitting the amount within one month if a Town Member, and two months if a Non-resident Member, he shall be apprised by letter, addressed to his last known place of residence, that unless the amount due by him be paid within fifteen days from the date of notice if a Town Member, and one month if a Non-resident Member, he will be liable to be sued, or his name published as a defaulter. He shall, moreover, be debarred from all the privileges of a Member if six months in arrear, until the amount due by him is paid. Persons not paying after such notice shall cease to be Members.

Section 8.—Ladies may be admitted as Members upon the same terms, and under the same regulations in all respects, as Gentlemen.

CHAPTER IV.

WITHDRAWAL OF MEMBERS.

Section 1.—Any Member may withdraw from the Society by intimating his wish to do so by letter addressed to the Secretary, without continuing his subscription beyond the quarter of the year in which his resignation is sent in; subject nevertheless to his being sued, or his name being published among the Defaulters (as per Section 7 of Chapter III.) if his arrears of subscription, or other debts to the Society, are not paid.

Section 2.—A resigning Member shall be at liberty to withdraw his letter of resignation, on payment of arrears, without going through the form of re-admission; provided such notice of withdrawal be given during the year in which the resignation has been notified.

Section 3.—Retiring Members and Members, whose names have been removed from the list owing to long absence from India, desiring to rejoin can do so without any formal re-election; their desire to rejoin being notified for the information and consideration of the Monthly General Meeting, and to be agreed to, or otherwise, at such Meeting.

CHAPTER V.

PRIVILEGES OF MEMBERS.

Section 1.—The Members have the right to be present and to vote at all General Meetings; to propose Candidates for admission into the Society as Members, also to have personal access to the Museum, Library, and Garden of the Society, and to introduce visitors at the Ordinary Meetings.

Section 2.—Members shall be entitled to a share of all seeds purchased by, or presented to, the Society; they can indent, at least once a year, on the Society's Garden for plants; they shall also be entitled to a copy of the Society's *Journal*, published subsequently to their election, and to previously published volumes on payment of the cost charges.

Section 3.—Members in the Country applying for seeds shall distinctly state to whose care such seeds are to be delivered in Calcutta, or how otherwise they are to be forwarded: the Society cannot despatch them at its own expense, but, if the agency of the Society be desired by Members in the Mofussil, the charge for packing the vegetable and flower seeds of the season in tin and wax cloth, and forwarding the same (exclusive of the cost of freight per Steamer, Railway hire, or other mode of conveyance, for which separate provision will have to be made by Members) will be Rs. (5) five annually, payable in advance.

Section 4.—Only Members actually resident in India shall have claims upon the Society's Garden, or seeds imported by the Society, or copies of the *Journal*, unless they continue their subscription while abroad.

Section 5—The privileges of newly elected Members, and Members rejoining the Society shall be regulated as follo according to date of election and re-admission, in order to equalize such privileges with those enjoyed by Members paying Subscription for the full year :—

Members elected in the months of January, February, and March, in each year, paying the full year's subscription, shall be entitled to full privileges.

Members elected in the months of April, May, and June, paying only three quarter's subscription, shall receive one packet less of Vegetable seeds, than members paying the full year's subscription, but be entitled to all other privileges, together with the right to purchase the extra packet of Vegetable seeds at Member's rates.

Members elected in the months of July, August, and September, paying only two quarter's subscription, shall have one packet less each of Vegetable and Flower seeds, than Members paying the full year's subscription, but be entitled to all other privileges, and be allowed to purchase the extra packets of Vegetable and Flower seeds at Member's rates.

Members elected in the months of October, November, and December, paying only one quarter's subscription, will be entitled simply to one packet of Flower seeds, with the right, however, to purchase two packets of Vegetable seeds at Member's rates, or Members may, in lieu of quarterly subscriptions, elect to pay a consolidated amount equal to a full year's subscription, and claim all the privileges under the rules of the Society.

CHAPTER VI.

OF HONORARY MEMBERS.

Section 1.—HonoraryMembers shall be persons eminent for their knowledge of, or encouragement given to, Agriculture or Horticulture, or for services rendered to the Society.

Section 2.—Persons proposed as Honorary Members shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

Section 3.—Honorary Members shall be exempted from the payment of fees and contributions ; and they shall be entitled to all the privileges of Ordinary Members.

Section 4.—No Office-Bearer of the Society shall, in future, be eligible as an Honorary Member during his tenure of office.

CHAPTER VII.

OF CORRESPONDING MEMBERS.

Section 1.—The Corresponding Members of the Society shall be constituted of such persons, not resident in Calcutta, or within one hundred miles thereof, as may show a willingness to promote the objects of the Society.

Section 2.—Corresponding Members shall not be limited as to numbers ; they shall have the privilege of attending the Meetings of the Society, but shall have no voice in the business ; they shall receive such copies of the Society's *Journal* as may contain their contributions, but shall not be entitled to receive seeds, plants, &c.

Section 3.—Persons proposed as Corresponding Members shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

CHAPTER VIII.

OF ASSOCIATES.

Section 1.—Associates shall be persons well known for their practical knowledge of, or encouragement given to, Agriculture or Horticulture, or for services rendered to the Society, but who are not likely to apply to become Ordinary Members.

Section 2.—Persons proposed as Associates shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

Section 3.—Associates shall be exempted from the payment of fees and contributions ; they shall have all the privileges of Ordinary Members, except that of voting at Meetings of the Society.

CHAPTER IX.

GENERAL MEETINGS.

The General Meetings to be held by the Society shall be of three kinds : 1st, Annual—2nd, Ordinary—3rd, Special.

CHAPTER X.

ANNIVERSARY GENERAL MEETING, ELECTION OF OFFICERS, COUNCIL, COMMITTEES, AND ANNUAL REPORT.

Section 1.—An Anniversary General Meeting shall be held in January of each year, for the election of Officers and Council for the ensuing year, for the nomination of the several Standing Committees, and to receive and hear read the Annual Report on the financial and general concerns of the Society.

Section 2.—The Officers shall consist of :—

1 President.
4 Vice-Presidents.
1 Secretary.
1 Deputy-Secretary and Treasurer.

Section 3.—The President and Council shall, previous to the Meeting, nominate the persons whom they recommend for election as Office-Bearers and Council ; and ballotting lists containing the names of the Members recommended, leaving a blank column opposite for such alterations as Members may wish to make, shall be prepared one week before the day of election. A copy of the list shall be handed to each Member present at the Meeting, and should he disapprove of any name or names, or be desirous of inserting some other name or names, he shall erase or insert accordingly.

Section 4.—The Chairman shall appoint two Scrutineers, not Members of the Council, to examine the lists and report the result to the Meeting.

Section 5.—In the event of a vacancy during the year, in the list of Officers or Council of the Society, such vacancy shall be filled up for the remainder of the year on the recommendation of the

Council, at the second Monthly Meeting after the occurrence of such vacancy.

Section 6.—With the exception of the President, Secretaries, and Treasurer, the Office-Bearers of the Society, after a tenure of office during two years, shall not be eligible for re-election till the expiry of twelve months.

Section 7.—The revision of the various Standing Committees shall also take place at each Anniversary Meeting, consisting of the following :—

Sugar Committee.
Cotton Committee.
Silk, Hemp, and Flax Committee.
Coffee and Tobacco Committee.
Oil and Oil-seed Committee.
Grain Committee.
Implements of Husbandry and Machinery Committee
Nursery Garden Committee.
Fruit and Kitchen Garden Committee.
Floricultural Committee.
Translation Committee.

Section 8.—The Council shall consist of the Office-Bearers and twelve Members.

Section 9.—No person shall hold at the same time more than one of the following offices; *viz.*, President, Vice-President, or Secretary.

Section 10.—The Council shall elect from their own body Sub-Committees of Finance and Papers, whose reports, on all matters referred to them, shall be submitted to the Council.

CHAPTER XI.

ORDINARY AND SPECIAL GENERAL MEETINGS.

Section 1.—Ordinary General Meetings shall be held at the Society's apartments, Metcalfe Hall, on the second Wednesday of every month throughout the year, at the hours of 4 P. M., from October to March, and 4½ P. M., from April to September, unless circumstances should render it expedient in the opinion of the Council, or any General Meeting, to alter the next General Meeting.

Section 2.—Strangers may be present at the Ordinary General Meetings, if introduced by Members, and their names given to the President for record.

Section 3.—The ordinary course of procedure at the General Meetings shall be as follows :—

1. The proceedings of the preceding General Meeting shall be read and submitted for confirmation.
2. The names of the gentlemen proposed as Members at the last Meeting shall be announced for ballot.
3. Motions, of which notice was given at the last Meeting, shall be brought forward and disposed of.
4. Notice of Motions shall be given for entry in the proceedings of the Meeting.
5. The names of gentlemen proposed as Members shall be announced.
6. The various reports, &c., on questions referred to the Council, shall be submitted for consideration.
7. Papers and communications received since the last Meeting, together with their respective presentations, shall be brought to notice.

Section 4.—Special General Meetings may be convened at any time, on a requisition to that effect to the President, signed by at least six Members, who thereupon will call the same, through the Secretary or Deputy-Secretary, by public advertisement in three of the newspapers of the Presidency. No Special Meeting shall take place without a month's previous notice being given, unless the case be urgent.

Section 5.—No stranger shall be permitted to be present at Special Meetings of the Society.

Section 6.—Notice of motion on questions of Finance, or other matters of importance, shall be given at a General Meeting preceding that on which the subject is to be disposed of, in order that Members, who take an interest in the question, may have an opportunity of expressing their assent or dissent; and no motion, of which notice has not been given, shall be carried at the Meeting at which it is proposed, if any three Members present vote for its postponement.

Section 7.—Motions of which previous notice has been given shall take precedence of all others.

Section 8.—Mofussil Members shall have the privilege of voting on questions of which one month's notice is given, sending their votes, post-paid, to the Secretary for record.

CHAPTER XII.

COUNCIL.—POWERS AND DUTIES.

Section 1.—The Government of the Society and the management of its concerns are intrusted to the Council, subject to no other restrictions than are imposed by the Bye-Laws, and to no other interference than may arise from the decisions of the Members assembled in General Meetings.

Section 2.—The Council shall meet once at least in every calendar month throughout the year, on such day or days as they shall deem expedient.

Section 3.—No Meeting of the Council shall be competent to enter on, or decide any business, unless three or more Members be present.

Section 4.—The Council may appoint persons, not Members of it, to be salaried Clerks or Servants, for carrying on the necessary concerns of the Society, and may define the duties to be performed by them respectively, and may suspend any Clerk or Servant from office whenever it shall appear to them necessary; provided always that such appointment or suspension shall be reported to the next General Meeting of the Members, to be confirmed or annulled as may be decided by such Meeting.

Section 5,—The Council shall present and cause to be read to the Anniversary General Meeting, a report on the general concerns of the Society for the preceding year. The report shall state the income and expenditure, the receipts and disbursements, and the increase or the decrease of the Society during that year; and give an estimate in detail of the probable income and expenditure of the succeeding year.

Section 6.—The Council shall distribute seeds and plants to all public gardens, reporting their proceedings to the next Meeting of the Society. No other resolution of the Council for disposing of, or pledging the funds or property of the Society to any amount beyond the current expenses of the establishment, shall be acted upon, or be of any validity, until confirmed by the Society.

Section 7.—The President, or, in his absence, one of the Vice-Presidents, or, in their absence, the senior Member, shall preside at every Meeting of the Council.

Section 8.—All questions shall be decided by ballot, on the demand of any Member present; and the decision of the majority shall be considered the decision of the Meeting.

CHAPTER XIII.

THE DUTIES OF THE PRESIDENT AND VICE-PRESIDENTS.

Section 1.—The business of the President shall be to preside at all the Meetings of the Society, and regulate all the proceedings therein; and generally to execute, or see to the execution of the Bye-laws and Orders of the Society.

Section 2.—In case of the absence of the President from any of the Meetings, his place shall be filled by the senior Vice-President then present; and, in the absence of the Vice-President, by the senior Member present, who shall, for the time being, have all the authority, privilege, and power of the President.

CHAPTER XIV.

OF THE SECRETARY AND DEPUTY-SECRETARY.

Section 1.—The Secretary, or, in his absence, the Deputy-Secretary, shall exercise a general inspection over the servants and the affairs of the Society, and shall see that the Bye-Laws and Orders of the Society are executed; he shall also attend the Meetings of the Society, and read such papers as may be submitted.

Section 2.—The Secretary, or, in his absence, the Deputy Secretary, shall sign all letters and papers emanating from the Society.

Section 3.—The Deputy-Secretary shall draw up the correspondence of the Society, and be in daily attendance at the Society's apartments during the usual office hours.

CHAPTER XV.

OF THE TREASURER AND THE ACCOUNTS.

Section 1.—The Treasurer shall demand and receive, for the use of the Society, all moneys due by or payable to the Society, and shall keep full and particular accounts of all sums so received and paid.

Section 2.—The moneys as received shall be deposited in the Bank of Bengal; and when the surplus shall exceed Rupees 1,000, it shall be invested in Company's Securities, on behalf of the Society, in the name of the Secretary of the Bank of Bengal for the time being.

CHAPTER XVI.

OF COMMITTEES.

Section 1.—Besides the Standing Committees (Section 7, Chapter X.) the Members assembled in General Meetings may appoint Committees to report on any special matter relating to the object or concerns of the Society.

Section 2.—Every Committee shall cause Minutes to be taken of its proceedings.

Section 3.—Every Committee may appoint its own Chairman and Secretary.

Section 4.—Any Member of any Committee, who shall be personally interested in any question before that Committee, same, and shall not take part in any Report that may be drawn up upon the matter for submission to the Society.

Section 5.—The Secretary shall be, *ex-officio*, a Member of all Committees.

CHAPTER XVII.

OF THE PUBLICATIONS OF THE SOCIETY.

Section 1.—The *Journal*, or other Publications of the Society, shall be under the superintendence of the Council, and shall be printed from time to time, whenever a sufficient number of such papers as may be deemed of public utility have been collected to form part of a volume.

Section 2.—Contributors to the *Journal, &c.*, shall be entitled to twenty-five Copies of their papers.

CHAPTER XVIII.

DISTRIBUTION OF PRIZES.

Section 1,—The distribution of Prizes at the Periodical Vegetable and Flower Shows of the Society shall be undertaken by the President or senior Vice-President. In the absence of such Officer or Officers, the senior Member of the Committee, to whom the arrangements of the Show are entrusted, shall perform that duty.

Section 2.—The Council shall have the power of adopting from time to time any regulations for the management of the Shows that may seem to them expedient.

CHAPTER XIX.

AMENDMENTS OF THE BYE-LAWS.

Amendments, or alterations of the Bye-Laws may be proposed at any Ordinary Meeting of the Society; they shall, with the assent of the majority of the Members present, be entered on the Minutes, and if ordered by the said majority to lie over for consideration, the President shall direct them to be read by the Secretary, and stated for discussion at the next General Meeting; and if three-fourths of the Members, provided that not less than eleven Members be present, shall vote in favor of adopting them, they shall be recorded as a part of the Bye-Laws.

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